UTAH DIVISION OF OIL, GAS, AND MINING
STATE DECISION DOCUMENT

Co-Op Mining Company
Bear Canyon Mine
C/015/025
Wild Horse Ridge
Federal Leases U-020668 and U-38727
Emery County, Utah

July 3, 2001

CONTENTS

0013

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

COPY

July 3, 2001

Wendell Owen, Mine Manager
Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

Re: Revised Permit to Include Wild Horse Ridge Extension, Co-Op Mining Company, Bear Canyon Mine, C/015//025-AM01A, Outgoing File

Dear Mr. Owen:

The Division has processed the Wild Horse Ridge Addition to the Bear Canyon Mine, including all materials submitted as of this date and has determined the application adequate. The Decision Document and permit are enclosed. Please note the special conditions since they are critical to your ability to mine coal. The permit authorizes you to commence coal mining and reclamation operations on the surface but before conducting underground mining in the federal lease, you will need to obtain Federal Mine Plan Approval from the Secretary of the Interior. Please have both copies of the permit signed by an authorized representative and return one to the Division.

The Division reserves the right to amend or rescind any requirements of the permit to conform to any terms or conditions imposed by the Secretary in the approval of the mining plan.

Thank you for your cooperation during the permitting process. If you have any questions, please call me.

Sincerely,

Lowell P. Braxton
Director

drh/vs
Enclosures: (3)
cc: Joe Willcox, OSM-WRCC
Richard Manus, BLM w/o
Elaine Zieroth, USFS w/o
Price Field Office
P:\GROUPS\COAL\WP\015025.BCN\FINAL\COVDDWHR.DOC

File in:
C/015025/2001/Outgoing
Refer to:
☐ Confidential
☐ Shelf
☒ Expandable
Date 07030 for additional information

ADMINISTRATIVE OVERVIEW

Co-Op Mining Company
Bear Canyon Mine
Wild Horse Ridge
Federal Leases U-020668 and U-38727
C/015/018
Emery County, Utah

July 3, 2001

PROPOSAL

The proposed Wild Horse Ridge significant revision to the Bear Canyon Mine MRP was received by the Division on December 18, 1998. This significant revision is for the addition of Federal Leases U-020668 and U-38727 and fee coal totaling 1958.43 acres. The previous permit area was for 1377.75 acres, so the total acreage in the permit area will be 3336.18 acres. The proposed leases are east of the Bear Canyon Fault, and the proposal includes new surface facilities in the Right Fork of Bear Canyon. The Resource Recovery Protection Plan (R2P2) is still being processed so the Bureau of Land Management has not yet concurred with the proposal to mine federal coal, therefore this permit is conditioned such that mining the federal leases cannot commence until the R2P2 is approved and the mining plan approval is authorized by the Secretary of the Interior.

BACKGROUND

The original permit for the Bear Canyon Mine was issued on November 1, 1985. Mining began in the Blind Canyon Seam, and in 1994, the Division approved mining the Tank seam. The Division received the proposal to mine on the east side of the Bear Canyon Fault on December 18, 1998, and this was determined administratively complete on November 3, 1999. On January 27, 2000, the Division received a request for an informal conference from the Huntington-Cleveland Irrigation Company. The informal conference was held February 22, 2000, and the Division issued its findings and order on March 22, 2000. As documented in the technical analysis, all requirements of the order have been met.

The Bureau of Land Management has not yet concurred with the proposal because the resource recovery and protection plan has not been finalized and approved. Therefore, this permit does not authorize mining in the federal leases until the R2P2 is approved and the mining plan approval is authorized by the Secretary of

the Interior.

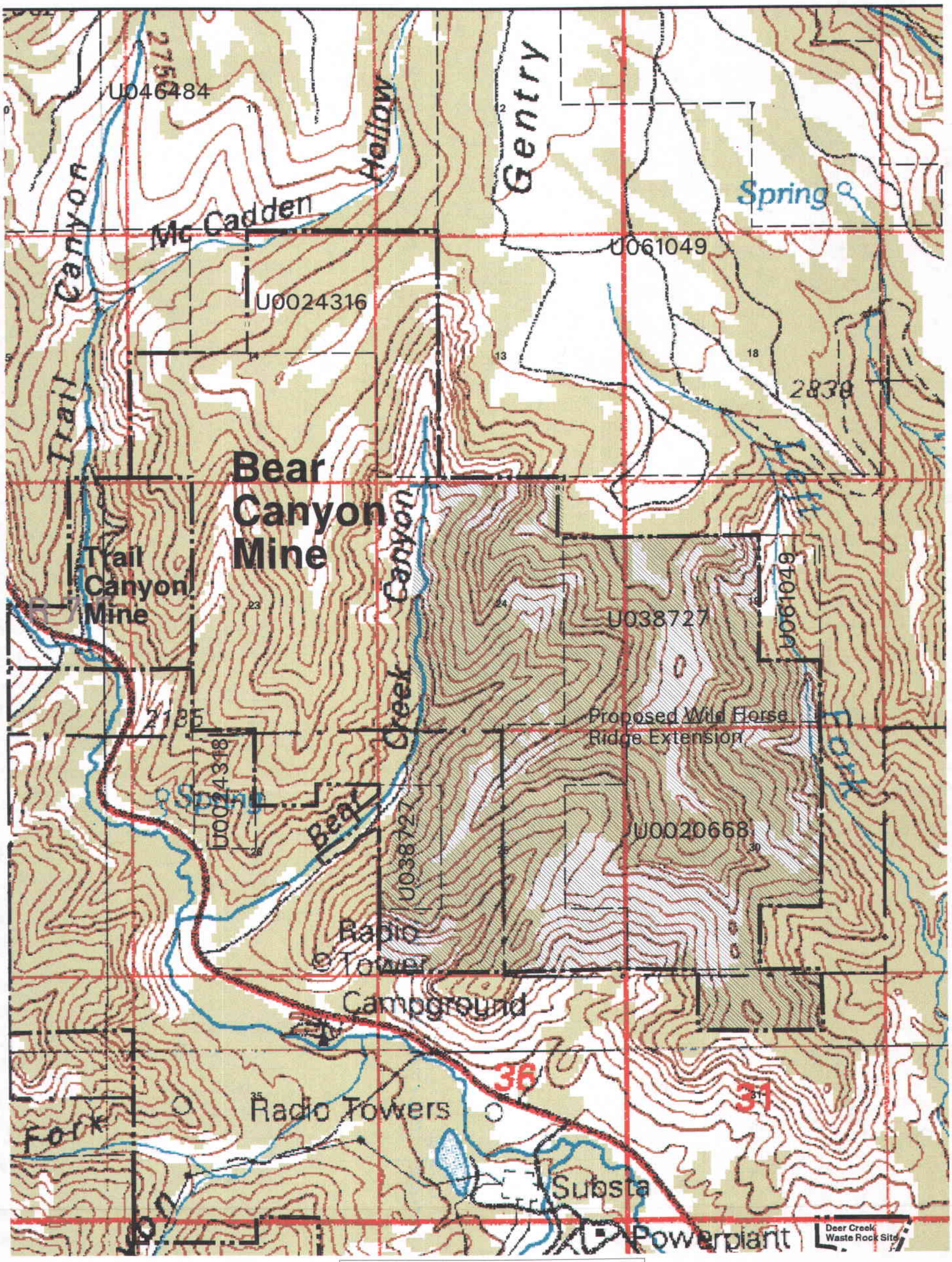
Since additional surface facilities are to be constructed the cost of reclamation has increased. A revised reclamation cost estimate determined the cost of reclamation to be $1,814,000. Co-Op Mining Company has posted bond through Lyndon Property Insurance Company.

RECOMMENDATION

A Division review including the technical analysis and cumulative hydrologic impact analysis has determined that Co-Op Mining Company has demonstrated through their application that mining in the Wild Horse Ridge area can be done in conformance with the Surface Mining Control and Reclamation Act, the Utah Code Annotated 40-10 et seq, and Utah Administrative Code, R645 rules.

With the exception of receiving approval from the Bureau of Land Management, all issues raised during the review process which are pertinent to this action have been adequately addressed.

It is recommended that the proposal to mine in the Wild Horse Ridge area be approved with the stipulation that there be no mining in the federal leases until the Bureau of Land Management has given its concurrence and the Office of Surface Mining, Reclamation and Enforcement has given federal mine plan approval.



Permit Area

General Location Map
Bear Canyon Mine

LOCATION MAP

File: bear.gra

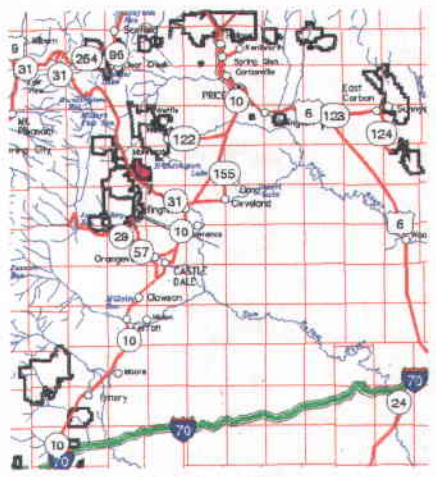
Compiled by: Dan Smith Date: June 12, 2001

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

N

0 1/4 1/2 1 mi
0 1000 2000 5000 ft
0 1/4 1/2 1 k

Scale 1:24000 (verify scale)



Location Map

PERMITTING CHRONOLOGY

Co-Op Mining Company
Bear Canyon Mine
Wild Horse Ridge
Federal Leases U-020668 and U-38727
C/015/025
Emery County, Utah

July 3, 2001

December 18, 1998	Co-Op Mining Company submits a permit application to mine in the Tank seam in federal lease U-024316
November 3, 1999	Determination of Administrative Completeness.
November 16, 1999	Letters sent to federal, state and local governmental agencies.
December 1, 1999	This permit application was transmitted to federal agencies and state agencies were notified.
December 7, 14, 21, And 28, 1999	This permitting action published in *The Salt Lake Tribune*, the *Deseret News*, and the *Emery County Progress.*
January 24, 2000	Division's first Technical Analysis with deficiencies submitted to Co-Op Mining Company.
January 27, 2000	End of the public comment period, and the Division receives a request for an informal conference from the Huntington-Cleveland Irrigation Company.
February 22, 2000	Informal Conference held.
March 22, 2000	Division issues its findings and order from the informal conference.
May 8, 2000	Co-Op Mining Company responds to the Technical Analysis.
July 28, 2000	Division's second Technical Analysis with deficiencies submitted to Co-Op Mining Company.
January 24, 2001	Co-Op Mining Company responds to the Technical Analysis.

April 17, 2001	Division's third Technical Analysis with deficiencies submitted to Co-Op Mining Company.
April 27, 2001	Co-Op Mining Company responds to the Technical Analysis.
June 21, 2001	Division's fourth Technical Analysis with no deficiencies except the Bureau of Land Management concurrence letter.
July 3, 2001	Co-Op Mining Company post bond in the amount of 1,814,000.
July 3, 2001	Permit for mining the Wild Horse Ridge area is issued with 3 stipulations.

MINING PLAN INFORMATION

Mine Bear Canyon County: Emery

Permit ID C/015/025 ( ) New (X) Revision ID SR98-1

Permittee Co-Op Mining Company.

Address P.O. Box 1245, Huntington, Utah 84528 Phone: (435) 687-2450

Official & Title Wendell Owen - Resident Agent

Proposed Operations

Federal Lease(s) Addition of Leases U-020668 and U-38727

( ) Surface (X) U/G Mining Method(s) Room & Pillar W/Continuous Miner

Coal Seam(s) to be Mined:

Seam Name	Coal Thickness	Seam Depth
Blind Canyon	5 to 11 feet, 8avg	0 to1200 feet (~650 feet ave.)

Surface Ownership (Acres)	**Existing Permitted Area**	**Proposed Permitted Area**	**Total Mine Permitted Area**
Federal	320.00	1290.25	1610.25
Non-Federal	1057.75	668.18	1725.93
TOTAL Acres	1377.75	1958.43	3336.18
Coal Ownership (Acres)			
Federal Lease(s)	320.00	1366.71	1686.71
Non-Federal	1057.75	591.72	1649.47
TOTAL Acres	1377.75	1958.43	3336.18
Disturbed Acres	29.1	7.3	36.4
Mineable Coal (Tons)			
Federal	0	11,748,163	11,748,163
Non-Federal	14,737,142	4,348,498	19,085,640
TOTAL Tons	14,737,142	16,096,661	30,833,803

	Existing Permitted Area	Proposed Permitted Area	Total Mine Permitted Area
Recoverable Coal (Tons based on 50% recovery)			
Federal	0	5,874,082	5,874,082
Non-Federal	7,368,571	2,174,249	9,542,820
TOTAL Tons	7,368,571	8,048,331	15,416,902

Ave Annual Production: Current average production rate is about 1,000,0000 tons per year which will increase to about 1,500,000 tons per year with the proposed addition.

Year Mining Ends 2010

FINDINGS

Co-Op Mining Company
Bear Canyon Mine
Wild Horse Ridge Revision
Includes Federal Leases U-020668 and U-38727
C/015/025
Emery County, Utah

July 3, 2001

1. With the stipulation that underground coal mining and reclamation activities in federal leases U-020668 and U-38727 may not commence until a mining plan approval is authorized by the Secretary of the Interior, the revised plan and the permit application is accurate and complete and all requirements of the Surface Mining Control and Reclamation Act and the approved Utah State Program (the "Act") have been complied with. Refer to June 21, 2001, Technical Analysis (R645-300-133.100)

2. The proposal includes the addition of 7.3 acres of new disturbance in the Right Fork of Bear Canyon. Co-Op has demonstrated that reclamation as required by the State Program can be accomplished according to information given in the permit application. See Technical Analysis dated June 21, 2001 (R645-300-133.710).

3. An assessment of the probable cumulative impacts of all anticipated coal mining and reclamation activities in the general area on the hydrologic balance has been conducted by the Division and no significant impacts were identified. The Mining and Reclamation Plan (MRP) proposed under the revised application has been designed to prevent damage to the hydrologic balance in the permit area and in associated off-site areas. See CHIA updated for mining in the Wild Horse Ridge area dated June 21, 2001. (R645-300-133.400 and UCA 40-10-11 (2)(c)).

4. The proposed lands to be included within the permit area are:

    a. Not included within an area designated unsuitable for underground coal mining operation (R645-300-133.220);

    b. Not within an area under study for designated land unsuitable for underground coal mining operations (R645-300-133.210);

    c. Not on any lands subject to the prohibitions or limitation of 30 CFR 761.11 {a} (national parks, etc), 761.11{f} (public buildings, etc.) and 761.11 {g} (cemeteries);

d. Not within 100 feet of a public road (R645-300-133.220); and

e. Not within 300 feet of any occupied dwelling (R645-300-133.220).

5. The operation would not affect the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats as determined under the Endangered Species Act of 1973 (16 USC 1531 et seq.) See concurrence letter from United States Fish and Wildlife, dated September 19, 2000. (R645-300-133.500)

6. The Division's issuance of a permit is in compliance with the National Historic Preservation Act and implementing regulations (36 CFR 800). See letters from State Historic Preservation Office, dated September 20, 1999 and February 14, 2001. (R645-300-133.600)

7. The applicant has the legal right to enter and conduct mining activities in the Wild Horse Ridge Area by virtue of fee and federal coal leases held by C.O.P. coal Development Company and leased to co-Op Mining Company. Mining nay not commence in federal leaded Lease U-038727and U-0020668 until federal mining plan approval is authorized by the Secretary of the Interior. (See Appendix 2-B of PAP) (R645-300-133.300)

8. A 510 (c) report has been run on the Applicant Violator System (AVS), which shows that: prior violations of applicable laws and regulations have been corrected; neither Co-Op Mining Company nor any affiliated company, are delinquent in payment of fees for the Abandoned Mine Reclamation Fund; and the applicant does not control and has not controlled mining operations with demonstrated pattern of willful violations of the Act of such nature, duration, and with such resulting irreparable damage to the damage to the environment as to indicate an intent not to comply with the provisions of the Act (A 510 (c) report was verified on July 2, 2001, see memo to file dated July 2, 2001.) (R645-300-133.730)

9. Underground mining operations to be performed under the permit will not be inconsistent with other operations anticipated to be performed in areas adjacent to the proposed permit area.

10. The applicant has provided adequate reclamation bond by posting a surety bond for the Bear Canyon Mine payable to the Division and the Office of Surface Mining in the amount of $1, 814,000. (R645-300-134)

11. No lands designated as prime farmlands or alluvial valley floors occur on the permit area. (R645-302-313.100 and R645-302-321.100)

12. The proposed postmining land-use of the permit area is the same as the pre-

mining land use and has been approved by the Division and the surface land management agency, the United States Forest Service. (Consent letter dated May 21, 2001.)

13. The Division has made all specific approvals required by the Act, the Cooperative Agreement, and the Federal Lands Program.

14. All procedures for public participation required by the Act, and the approved Utah State Program are in compliance. A public hearing was held on February 22, 2000 and all orders resulting from the hearing have been resolved. See Technical Analysis dated June 21, 2001 and Affidavits of Publication, dated December 28, 1999. (R645-300-120)

15. No existing structures will be used in conjunction with mining of the Wild Horse Ridge extension, other than those constructed in compliance with the performance standards of R645-301 and R645-302 (R645-300-133.720)

Permit Supervisor

Permit Supervisor

Associate Director, Mining

Director

FEDERAL

PERMIT
C/015/025

July 3, 2001
(Revised)

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801
(801) 538-5340

This permit, C/015/025, is issued for the state of Utah by the Utah Division of Oil, Gas and Mining (Division) to:

Co-Op Mining Company
P. O. Box 1245
Huntington, Utah 84528
(435) 687-2450

for the Bear Canyon Mine. A performance bond is filed with the Division in the amount of $1,825,000 payable to the State of Utah, Division of Oil, Gas and Mining and the United States Department of Interior, Office of Surface Mining Reclamation and Enforcement. The Division must receive a copy of this permit signed and dated by the permittee.

Sec. 1 STATUTES AND REGULATIONS - This permit is issued pursuant to the Utah Coal Mining and Reclamation Act of 1979, Utah Code Annotated (UCA) 40-10-1 et seq, hereafter referred to as the Act.

Sec. 2 PERMIT AREA - The permittee is authorized to conduct coal mining and reclamation operations on the following described lands within the permit area at the Bear Canyon Mine, situated in the state of Utah, Emery County, and located:

Township 16 South, Range 7 East, SLBM

Section 13:	W1/2W1/2;
Section 14:	S1/2, NE1/4;
Section 23:	E1/2, E1/2W1/2;
Section 24:	W1/2, W1/2E1/2, E1/2SE1/4, SE1/4NE1/4;
Section 25:	All;
Section 26:	NE1/4 NE1/4, NW1/4 NE1/4, N1/2 SW1/4 NE1/4 and the access/haul road and topsoil storage area as shown on Plate 2-1 of the Mining and Reclamation Plan

Township 16 South, Range 8 East, SLBM

Section 19:	S1/2NW1/4, SW1/4, SW1/4SE1/4;
Section 30:	W1/2, W1/2NE1/4, NW1/4SE1/4;
Section 31:	NE1/4NW1/4, NW1/4NE1/4

This legal description is for the permit area of the Bear Canyon Mine. The permittee is authorized to conduct coal mining and reclamation operations connected with mining on the foregoing described property subject to the conditions of the leases, the approved mining plan, including all conditions and all other applicable conditions, laws and regulations.

Sec. 3 COMPLIANCE - The permittee will comply with the terms and conditions of the permit, all applicable performance standards and requirements of the State Program.

Sec. 4 PERMIT TERM - This permit expires on November 2, 2005.

Sec. 5 ASSIGNMENT OF PERMIT RIGHTS - The permit rights may not be transferred, assigned or sold without the approval of the Director, DOGM. Transfer, assignment or sale of permit rights must be done in accordance with applicable regulations, including but not limited to 30 CFR 740.13{e} and R645-303.

Sec. 6 RIGHT OF ENTRY - The permittee shall allow the authorized representative of the DOGM, including but not limited to inspectors, and representatives of the OSMRE, without advance notice or a search warrant, upon presentation of appropriate credentials, and without delay to:

(a) Have the rights of entry provided for in 30 CFR 840.12, R645-400-110, 30 CFR 842.13 and R645-400-220;

(b) Be accompanied by private persons for the purpose of conducting an inspection in accordance with R645-400-210 and 30 CFR 842, when the inspection is in response to an alleged violation reported to the Division by the private person.

Sec. 7 SCOPE OF OPERATIONS - The permittee shall conduct underground coal mining activities only on those lands specifically designated as within the permit area on the maps submitted in the approved plan and approved for the term of the permit and which are subject to the performance bond.

Sec. 8 ENVIRONMENTAL IMPACTS - The permittee shall minimize any adverse impact to the environment or public health and safety through but not limited to:

(a) Any accelerated monitoring to determine the nature and extent of noncompliance and the results of the noncompliance;

(b) Immediate implementation of measures necessary to comply; and

(c) Warning, as soon as possible after learning of such noncompliance, any person whose health and safety is in imminent danger due to the noncompliance.

Sec. 9 DISPOSAL OF POLLUTANTS - The permittee shall dispose of solids, sludge, filter backwash or pollutants in the course of treatment or control of waters or emissions to the air in the manner required by the approved Utah State Program and the Federal Lands Program which prevents violation of any applicable state or federal law.

Sec. 10 CONDUCT OF OPERATIONS - The permittee shall conduct its operations:

(a) In accordance with the terms of the permit to prevent significant, imminent environmental harm to the health and safety of the public; and

(b) Utilizing methods specified as conditions of the permit by DOGM in approving alternative methods of compliance with the performance standards of the Act, the approved Utah State Program and the Federal Lands Program.

Sec. 11 EXISTING STRUCTURES - As applicable, the permittee will comply with R645-301 and R645-302 for compliance, modification, or abandonment of existing structures.

Sec. 12 RECLAMATION FEE PAYMENTS - The operator shall pay all reclamation fees required by 30 CFR Part 870 for coal produced under the permit, for sale, transfer or use.

Sec. 13 AUTHORIZED AGENT - The permittee shall provide the names, addresses and telephone numbers of persons responsible for operations under the permit to whom notices and orders are to be delivered.

Sec. 14 COMPLIANCE WITH OTHER LAWS - The permittee shall comply with the provisions of the Water Pollution Control Act (33 USC 1151 et seq), and the Clean Air Act (42 USC 7401 et seq), UCA 26-11-1 et seq, and UCA 26-13-1 et seq.

Sec. 15 PERMIT RENEWAL - Upon expiration, this permit may be renewed for areas within the boundaries of the existing permit in accordance with the Act, the approved Utah State Program and the Federal Lands Program.

Sec. 16 CULTURAL RESOURCES - If during the course of mining operations, previously unidentified cultural resources are discovered, the permittee shall ensure that the site(s) is not disturbed and shall notify the DOGM. DOGM, after coordination with OSMRE, shall inform the permittee of necessary actions required. The permittee shall implement the mitigation measures required by DOGM within the time frame specified by DOGM.

Sec. 17APPEALS - The permittee shall have the right to appeal as provided for under R645-300.

Sec. 18SPECIAL CONDITIONS - There are special conditions associated with this permitting action, as described in Attachment A.

The above conditions (Secs. 1-18) are also imposed upon the permittee's agents and employees. The failure or refusal of any of these persons to comply with these conditions shall be deemed a failure of the permittee to comply with the terms of this permit and the lease. The permittee shall require his agents, contractors and subcontractors involved in activities concerning this permit to include these conditions in the contracts between and among them. These conditions may be revised or amended, in writing, by the mutual consent of DOGM and the permittee at any time to adjust to changed conditions or to correct an oversight. DOGM may amend these conditions at any time without the consent of the permittee in order to make them consistent with any federal or state statutes and any regulations.

THE STATE OF UTAH

By: Lowell P Braxton

Date: 7/3/01

I certify that I have read, understand and accept the requirements of this permit and any special conditions attached.

_____
Authorized Representative of the Permittee

Date: _____

ATTACHMENT A
Special Conditions

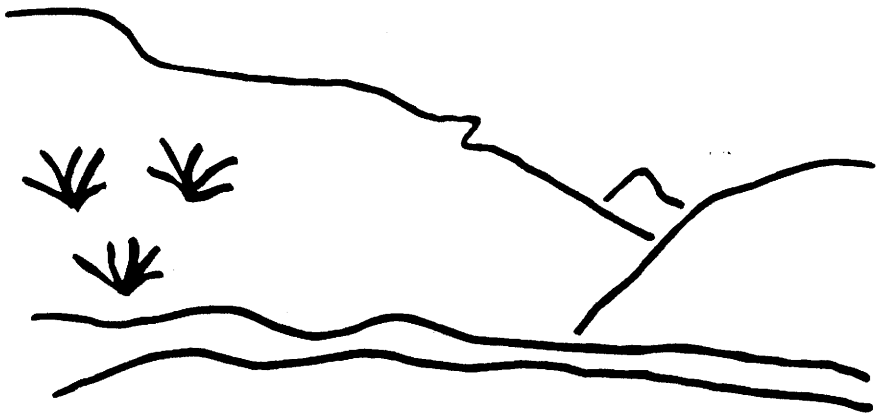
1. Underground coal mining and reclamation activities in federal coal leases U-038727 and U-0020668 may not commence until a mining plan approval is authorized by the Secretary of the Interior.

2 Co-Op Mining Company will submit water quality data for the Bear Canyon Mine beginning with data for the first quarter of 2001 in an electronic format through the Electronic Data Input web site, http://hlunix.hl.state.ut.us/cgi-bin/appx-ogm.cgi.

3. "Drainage or pumping of in-mine water to the old mine working north of the Big Bear and Birch Spring will be controlled and monitored as stipulated by the Division with revision of that procedure only as directed by the Division and with the prior approval of the Division."(Division Order, Informal Hearing, Cause No. ACT/015/025, Dated May 20, 1991, as Modified on April 18, 1997.)

DIVISION TECHNICAL ANALYSIS

State of Utah



Utah Oil Gas and Mining

Coal Regulatory Program

Bear Canyon Mine
Wild Horse Ridge Revision
C/015/025-SR98(1)-5
Technical Analysis
June 21, 2001

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TECHNICAL ANALYSIS

INTRODUCTION

The proposed Wild Horse Ridge significant revision amendment to the Bear Canyon Mine MRP, was received by the Division on December 18, 1998. This significant revision is for the addition of Federal Leases U-020668 and U-38727 and fee coal. The proposed leases are east of the Bear Canyon Fault, and the proposal includes new surface facilities in the Right Fork of Bear Canyon. The Division determined the amendment to be Administratively Complete on November 3, 1999. The first technical review completed on January 24, 2000, found the amendment deficient. The package was resubmitted on May 8, 2000, and the Division sent its technical analysis July 28, 2000. The applicant responded with on January 24, 2001, with additional information received in March 2001. The Division sent its technical analysis of this submittal on April 17, 2001, and the Division received the current submittal from Co-Op on April 27, 2001.

The Division has received concurrence letters from the State Historic Preservation Office, the Fish and Wildlife Service, and the Forest Service, which manages much of the surface within the proposed addition to the permit area. The Bureau of Land Management has not concurred because there is not yet an approved resource recovery and protection plan. Before Co Op Mining Company begins mining federal coal; they will need concurrence from the Bureau of Land Management. They will also need federal mine plan approval.

INTRODUCTION

SUMMARY OF PERMIT CONDITIONS

As determined in this technical analysis, approval of the plan is subject to the following permit condition. The applicant is subject to compliance with this permit condition and must commit to comply with the requirements of this condition in the approved permit. Accordingly, the permittee must comply with the requirements of the following permit condition, as specified:

The Resource Recovery and Protection Plan is still being reviewed by the BLM and the determination of maximum economic recovery is still pending; therefore, underground coal mining and reclamation activities in federal coal leases U-038727 and U-0020668 may not commence until a mining plan approval is authorized by the Secretary of the Interior.

SUMMARY OF PERMIT CONDITIONS

GENERAL CONTENTS

IDENTIFICATION OF INTERESTS

Regulatory Reference: 30 CFR 773.22; 30 CFR 778.13; R645-301-112

Analysis:

Chapter 1 of the mining and reclamation plan is an introduction describing where information is located in the plan, and proposed changes are minor and general in nature.

Ownership and control information is in Chapter 2. The applicant is Co-Op Mining Company, and the mining and reclamation plan includes Co-Op's address, telephone number, resident agent, and employer identification number. The application also shows the officers and directors of CW Mining Company, a corporation which is doing business as Co-Op Mining Company. Thus, these people are, in effect, the officers and directors of Co-Op Mining Company. CW Mining Company will pay the abandoned mine reclamation fee.

Table 2-1 shows property ownership in and contiguous to the current and proposed addition to the permit area. This information and the legal description in Section 2.2.2 correspond with the information on Plates 2-1 and 2-2 and appear to be correct.

The current plan includes MSHA numbers for the Bear Canyon No. 1 and No. 2 Mines, and the application shows an MSHA number for the proposed facilities the Bear Canyon No. 3 Mine. The MSHA number for the Bear Canyon No. 4 Mine will be included during phase II of Wild Horse Ridge permitting (not yet proposed).

Findings:

Information provided in the proposal is adequate to meet the requirements of this section of the regulations.

VIOLATION INFORMATION

Regulatory Reference: 30 CFR 773.15(b); 30 CFR 773.23; 30 CFR 778.14; R645-300-132; R645-301-113

Analysis:

Appendix 2-A of the current mining and reclamation plan has a list of notices of violation and other enforcement actions taken by the Division, the Office of Surface Mining, and the Division of Air Quality. The applicant has received no violation notices in the past three years.

The plan says neither the applicant nor any subsidiary, affiliate, or persons controlled by or under common control with the applicant has had a federal or state permit to conduct coal mining and reclamation operations suspended or revoked in the five years preceding the date of submission of the application; or forfeited a performance bond or similar security deposited in lieu of bond.

Findings:

Information provided in the proposal is adequate to meet the requirements of this section of the regulations.

RIGHT OF ENTRY

Regulatory Reference: 30 CFR 778.15; R645-301-114

Analysis:

The application includes copies of the leases for the areas proposed to be added to the permit area, and the legal descriptions in these leases match the areas shown on the permit area maps and in Section 2.2.2. It appears the applicant has the required right of entry.

Findings:

Information provided in the proposal is adequate to meet the requirements of this section of the regulations.

LEGAL DESCRIPTION AND STATUS OF UNSUITABILITY CLAIMS

Regulatory Reference: 30 CFR 778.16; 30 CFR 779.12(a); 30 CFR 779.24(a)(b)(c); R645-300-121.120; R645-301-112.800; R645-300-141; R645-301-115.

Analysis:

Section 2.2.2 of the application contains a legal description of the current permit area and the proposed addition.

The proposed operations will not be within 100 feet of a public road or within 300 feet of an occupied dwelling. The existing mine is within 300 feet of occupied dwellings, but the plan contains approval letters from the owners and renters of these buildings.

According to the current mining and reclamation plan, no portion of the area to be permitted is within an area designated as unsuitable for mining, and it has several paragraphs, some of which were revised for this submittal, describing why it should not be considered unsuitable. The Division is unaware of any study or petition for designation as unsuitable.

Findings:

Information provided in the proposal is adequate to meet the requirements of this section of the regulations.

PERMIT TERM

Regulatory References: 30 CFR 778.17; R645-301-116.

Analysis:

The term of the permit will not change with the addition of the Wild Horse Ridge leases. The permit term is five years with right of successive renewal. The life of the mine will be extended several years as a result of this action.

The Division has on file a copy of the applicant's insurance policy, and it meets regulatory requirements.

No facilities would be used in common with any other permitted operation.

Findings:

Information provided in the proposal is adequate to meet the requirements of this section of the regulations.

PUBLIC NOTICE AND COMMENT

Regulatory References: 30 CFR 778.21; 30 CFR 773.13; R645-300-120; R645-301-117.200.

Analysis:

The application includes a copy of the proof of publication. The advertisements ran from December 7 through December 28, 1999, in *The Salt Lake Tribune*, the *Deseret New*, and the *Emery County Progress*. The public comment period expired on January 27, 2000, and the Division received a request for an informal conference on January 27, 2000. The request was from J. Craig Smith and Scott M. Ellsworth of Nielsen and Senior representing the Huntington-

Cleveland Irrigation Company. The conference was conducted February 22, 2000. The order resulting from the hearing required:

- The Division to continue its review.
- The applicant to include at least one in-mine drill hole at a location acceptable to the Division in the northern part of the Wild Horse Ridge area to further characterize Blackhawk sandstones and potential water-bearing upper sandstone member of the Star Point sandstone.
- The applicant to include relevant portions of a February 21, 2000, letter from Mayo and Associates in its application package.

The application has been modified in accordance with requirements of the order.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

FILING FEE

Regulatory Reference: 30 CFR 777.17; R645-301-118.

Analysis:

A filing fee is not required for significant revisions; it is only required for new permit applications.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR 783., et. al.

GENERAL

Regulatory Reference: 30 CFR 783.12; R645-301-411, -301-521, -301-721.

Analysis:

Analyses of the existing, premining environmental resources within the permit and adjacent area that may be affected or impacted by the proposed underground mining activities are discussed under other headings in this technical analysis.

Findings:

A determination of adequacy for this section will be determined to meet the regulatory requirements when all other information in this technical analysis is determined adequate. The Division has determined that each section of the application is complete and accurate.

PERMIT AREA

Regulatory Requirements: 30 CFR 783.12; R645-301-521.

Analysis:

The permit area is described in Section 2.2.2 of the PAP and shown on Plate 2-1, Permit Area Map. The permit area has the following boundaries:

Township 16 South, Range 7 East, SLBM

Section 13:	W1/4
Section 14:	S1/2, NE1/4
Section 23:	E1/2, E1/2 W1/2
Section 24:	W1/2, SE1/4, W1/2 NE1/4, SE1/4 NE1/4
Section 25:	ALL
Section 26:	NE1/4 NE1/4, NW1/4 NE1/4, N1/2 SW1/4 NE1/4

Township 16 South, Range 8 East, SLBM

Section 19:	S1/2 NW1/4, SW1/4, SW1/4 SE1/4
Section 30:	W1/2, W1/2 NE1/4, NW1/4 SE1/4
Section 31:	NE1/4 NW1/4, NW1/4 NE1/4

With the addition of the Wild Horse Ridge amendment, the permit acreage increased from 1,377.75 acres to 3,336.18 acres.

The Division checked Plate 2-2 and noticed that the permit boundaries do not match the legal description. The permit boundary in Section 26 in the SW1/4 NW1/4 appears to be 200 feet short on the map. The applicant stated that they will have a summer intern correct the problem. The Division does not consider the error to be major enough to prevent approval of the Wild Horse Ridge project.

The disturbed area boundaries for the Wild Horse Ridge are shown on Plate 2-4B, Plate 2-4C, Plate 2-4F and Plate 2-4G, which are the surface facilities maps. The disturbed area boundaries are also shown on the premining and postmining contour maps. The disturbed acres are listed in Section 3.3.14 on Table 3.3-1, Surface Disturbance Summary. The applicant will increase the disturbed area from 29.10 acres to 35.99 acres. None of the new disturbed acreage contains lands disturbed by mining activities prior to1977. The new disturbed areas include the Wild Horse Ridge access road, conveyor belt access/topsoil stockpile, upper conveyor belt No. 1 and No. 2 access roads, and the Wild Horse Ridge Blind Canyon seam portal area.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

HISTORIC AND ARCHEOLOGICAL RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.12; R645-301-411.

Analysis:

The current mining and reclamation plan contains information about one cultural resource site, the Bear Creek Shelter, in the area of the lower part of the conveyor. The application contains a report discussing the significance of this site and also showing results of a survey of the entire area proposed to be disturbed. No other sites were found. The Bear Creek Shelter is considered eligible for listing in the National Register of Historic Places.

The application contains a copy of a cultural resources report done by Kenneth Juell of the University of Utah Archeological Center. Part of the survey was done in the Wild Horse Ridge area and included four drill sites and associated access roads, mainly on Wild Horse Ridge. No cultural resource sites were found. According to this report, no other sites had previously been found in the area.

It is not clear from the report done by Kenneth Juell whether his report includes all available information about cultural resources in the area. In response to this concern, the applicant has included a commitment to conduct a literature search for all records of cultural resources in the area before doing any retreat mining. According to the applicant's representative, retreat mining should not occur for about four years.

Findings:

Information in the application is adequate to meet the requirements of this section of the regulations.

CLIMATOLOGICAL RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.18; R645-301-724.

Analysis:

The Mayo and Associates PHC, August 1999 incorporates current climatic information into the plan. Average annual precipitation varied between 10 and 15 inches from lower elevation gauging stations within the permit and adjacent area. Average annual precipitation at the higher elevation stations was 29 to 33 inches. The Palmer Hydrologic Drought Index for Utah Division 4 and Division 5 climatic regions are presented and discussed.

Findings:

The application meets the minimum requirements for this section.

VEGETATION RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.19; R645-301-320.

Analysis:

Appendix 9-G is a report on the vegetation of the area that would be disturbed. It includes quantitative measurements of vegetative cover and woody plant density in the proposed disturbed area and a reference area. It also contains measurements of vegetation productivity.

The proposed disturbed area has a variety of vegetation communities because there is a variety of aspects and soils over the length of the proposed conveyor and road. Except for the facilities area, disturbances would be fairly narrow and small in each community, so the

1different communities were not sampled separately. This did not, however, lead to a large sample size.

The vegetation communities in the proposed disturbed area include varying amounts of riparian, Salina wild rye, pinyon/juniper, Ponderosa pine, mountain brush, and sagebrush/grass. Dominant species were Salina wild rye, needle and thread grass, Utah juniper, and smooth brome, but several other species were also present. Vegetative cover was 42.50%, and woody plant density was 1010 per acre.

The reference area was chosen to be transitional between the lower drainage area and the pinyon/juniper/grass areas on the upper slopes. Dominant species were Salina wild rye, corymbed buckwheat, rubber rabbitbrush, Kentucky bluegrass, and hoary aster. While the proposed disturbed area was strongly dominated by grasses, the proposed reference area had cover more balanced between grasses and shrubs. Vegetative cover was 46.25%, and woody plant density was 1405 per acre.

Productivity in the area proposed to be disturbed was 125.31 pounds per acre for herbaceous species and 122.37 pounds per acre for woody species for a total of 247.68 pounds per acre. Vegetation productivity in the reference area was 286.17 pounds per acre for herbaceous species and 310.15 pounds per acre for woody species for a total of 596.32 pounds per acre. Obviously, productivity in the reference area was much greater than in the proposed disturbed area. This is acceptable because the success standard would be higher than what currently exists, and the consultant who wrote the report argues that the reference area continues to be an appropriate standard.

Findings:

Information in the proposal is adequate to meet the requirements of this section of the regulations.

FISH AND WILDLIFE RESOURCE INFORMATION

Regulatory Reference: 30 CFR 784.21; R645-301-322.

Analysis:

Wildlife Information

Plates 3-3 and 10-1 have been revised to include the proposed addition to the permit area. These maps show raptor nests and big game habitat. The entire proposed addition to the permit area is either critical elk or deer winter range. Several raptor nests are in the area including two within about 2000 feet of the proposed surface facilities.

The right fork of Bear Creek consistently has water in a few places, but it is not a fishery.

The Division has consulted with the Division of Wildlife Resources concerning the adequacy of wildlife information in the application and in the current mining and reclamation plan. The applicant has updated the raptor nesting information as a result of the survey conducted earlier this spring.

Threatened and Endangered Species

Most threatened or endangered species that could occur in Emery County occur at lower elevations than the mine and have no habitat in the proposed disturbed area. These are Barneby reed-mustard, Jones cycladenia, last chance Townsendia, Maguire daisy, Despain footcactus, Wright fishhook cactus, and the Winkler cactus. There have been no confirmed sightings of black-footed ferrets in Emery County in several years.

Bald eagles are common in the area during the winter and could occasionally fly through or roost in the proposed addition to the permit area. Mining would have negligible effects on these birds.

The proposed disturbed area does not contain habitat for the southwestern willow flycatcher, but it is not known whether suitable habitat exists in other parts of the proposed permit area addition. The proposed disturbed area has some willows and riparian vegetation, but it was not enough that it was encountered in vegetation cover samples or that it would provide habitat for southwestern willow flycatchers. Woody plant density measurements included coyote willow at a density of 25 per acre.

Canyon sweetvetch (*Hedysarum occidentale* Var. *canone*) is listed by Region 4 of the Forest Service as a sensitive species. This species has been found in the proposed disturbed area, and locations are documented in the vegetation report in Appendix 9-G. Link trail columbine (*Aquilegia flavescens* Var. *rubicunda*), another Forest Service Region 4 sensitive species, has also been found in the area.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.21; 30 CFR 817.22; 30 CFR 817.200(c); 30 CFR 823; R645-301-220; R645-301-411.

Analysis:

Chapter 8, Soil Resources, Sections 8.1 through 8.7, discusses the soil resources within the proposed Wild Horse Ridge project for the Bear Canyon Mine. Relevant soils information includes prime farmland investigation, current and past soil surveys, soil characterizations, and substitute topsoil identification. The Analysis section discusses resource information as follows:

- Prime Farmland Investigation
- Soil Survey Information
- Soil Characterization
- Substitute Topsoil

Prime Farmland Investigation

A Prime Farmland site investigation was performed by the Natural Resources Conservation Service (NRCS). A negative determination was made for Prime Farmland or farmland of statewide importance within the proposed Wild Horse Ridge area (sections 24 and 25 T.16S. R. 7E. and sections 19 and 30 T.16S. R. 8E). The determination letter from the NRCS is dated July 9, 1999, and is included in Appendix 8-C.

Soil Survey Information

Chapter 8 supplies soil resource information for the Bear Canyon Mine and the proposed Wild Horse Ridge expansion based on six soil surveys as follows:

1. 1980. Soil and vegetation survey for Bear Canyon, USDA San Rafael Soil Conservation District and the Soil Conservation Service, Appendix 8-B pp 1 to 13.
2. 1990. Order I soil survey, USDA Soil Conservation Service, Appendix 8-B pp 13
3. 1992. Substitute topsoil survey for Bear Canyon, Appendix 8-E.
4. 1996. Soil samples collected by Co-Op for Wild Horse Ridge. Appendix 8-F.
5. 1998. Order II soil survey of Wild Horse Ridge, USDA Natural Resource Conservation Service.
6. 1999. Order I soil survey of Wild Horse Ridge, conducted by Environmental Industrial Services, Appendix 8-F. The survey incorporates information from the 1998 Order II, NRCS soil survey and the 1996 soil sampling. The Wild Horse Ridge site contains seven soil mapping units as follows:

A Pathead-Cabba Complex, 30 to 70 % slopes
B Winetti, High Elevation, 5 to 30 % slopes.
C Winetti, High Elevation-Rock Outcrop, 10 to 30 % slopes
D Doney, Deep, 10 to 30 % slopes
E Datino-Guben Complex, 30 to 80 % slopes
F Guben-Pathead Complex, 30 to 80 % slopes
G Doney-Cabba-Podo Complex, 30 to 80 % slopes

All mapping and soil survey work were performed according to the standards of the National Cooperative Soil Survey. Based on the site-specific soil descriptions, and laboratory data, each of the soils was classified according to current NRCS soil taxonomy, and correlated with the NRCS Order II soil survey. Documentation of field data is presented in Map B-Soil Data Collection Map; Appendix C-Field Soil Profile Descriptions and Transect Data; Appendix D-Soil Profile and Landscape Photographs. Appendix F contains information comparing soil mapping units between the 1999 Order I soil survey to the NRCS Order II soil survey. Adjustment summarizations were given for each specific change in identifying and renaming soils within the Wild Horse Ridge area.

The 1990 and 1999 Order I soil survey for the Bear Canyon Mine and Wild Horse Ridge cover approximately 32 acres in Bear Canyon and in the Wild Horse Ridge mine expansion area. Approximately 480 acres are mapped on two soil maps (Plate 8-1 and Plate 8-1A) which are scaled at 1-inch equals 200-feet, with 5-foot contour intervals. A total of 10 different soil mapping units are identified. Plate 8-1 shows three soil mapping units as DZE, PDR, and TR, with "D" identified as disturbed area soils. These three mapping units are for the existing Bear Canyon Mine disturbance area. Plate 8-1A identifies the 7 soil mapping units as contained in the 1999 Order I soil survey for the Wild Horse Ridge mine expansion project as follows:

Appendix 8-F Soil Map Unit	MRP Soil Map Unit	Soil Name
A	PC	Pathead-Cabba Complex
B	WIN	Winetti, High Elevation
C	WR	Winetti, High Elevation-Rock Outcrop
D	DON	Doney, Deep
E	DG	Datino-Guben Complex
F	GP	Guben-Pathead Complex
G	DCP	Doney-Cabba-Podo Complex

Appendix 8-F identifies the approximate range and average soil salvage depth for each soil map unit, based on evaluations of all field and laboratory data, plant rooting depth and soil

rock content. In the following table, DOGM staff have itemized the depth of salvage along with root and subsurface rock information for each soil type:

Map Unit	Salvage Layer (inches) Approximate Range	Salvage Layer (inches) Average Depth	Fine Roots Rooting Depth (inches)	Subsurface Rock Within Soil Salvage Layer (percent)
PC	8 - 15	12	15	<5 to 45
WIN	10 -30	15	no pit	no pit information
WR	0 - 20	10	24	50 to 60
DON	30 -60	40	60	7 to 15
DG	20 - 40	30	20	45
GP	0 - 30	10	36	60
DCP	6 - 30	15	34	12 to 40

Soil Characterization

Section 8.3, Soil Information, identifies and describes each of the 10 soil groups as contained in the 1990 and 1999 Order I soil surveys. Soil descriptions for each of the 10 soil mapping units are summarized in Table 8.3-1 and in Section 8.3.2.

Wild Horse Ridge

In May 1999, a site specific Order 1 soil survey for the proposed Wild Horse Ridge project area was performed and prepared by Mr. Daniel Larsen, Soil Scientist, Environmental Industrial Services (Appendix 8-F). The detailed survey contains soil descriptions, soil pedon descriptions, soil salvage suitability analysis, laboratory soil testing data, field soil profile descriptions, soil and landscape photographs, soils map, soil data collection map and salvageable soils map. Soil pedons were characterized by the soil horizons at each sampling location. All profile descriptions were recorded on standard NRCS forms and are provided in Appendix C within Appendix 8-F. Field parameters for each soil pedon description includes horizon information, soil color, texture, rock fragment, soil structure, roots, clay films, and effervescence with 0.1N hydrochloric acid. In addition, general site descriptions include vegetation, climate regimes, land form physiography, relief, elevation, slope, aspect, erosion condition, permeability, drainage class, depth to saturation (ground water) if encountered, salts or alkali if present, and surface rock. Generalized soil properties are summarized as follows for each soil type:

In 1996, four soil pits (WHRS-1 thru WHRS-4) were analyzed in the Wild Horse Ridge planned disturbance area. Test results are included with the Order I soil Survey in Appendix F. Pit locations are shown on Plate 8-1A.

Map Unit	Map Symbol	Land Form	% Slope	Parent Material	Soil Depth	Texture	Rock Fragment Class	General Vegetation
A	PC	foothills	30-70	colluvium and shale	shallow to deep	sl, l, cl	stony to very cobbly	Pinion-Juniper
B	WIN	narrow canyon bottoms	5-30	alluvium and colluvium	deep	sl, l, ls	gravelly to bouldery	Cottonwood Douglas-fir Dogwood Wildrose
C	WR	narrow canyon bottoms	5-30	alluvium, colluvium and sandstone	shallow to deep	sl, l, ls	gravelly to bouldery	Cottonwood Douglas-fir Dogwood Wildrose
D	DON	toe slope, slight bench	10-30	colluvium, slope wash	deep	sl, l, ls	non-stony to stony	Ponderosa Pine Juniper Douglas-fir
E	DG	steep canyon slope, north aspect	30-80	colluvium and shale	moderate deep to deep	sl, l, cl	very stony to non-stony	Douglas-fir Pinion Mt. Mahogany Serviceberry
F	GP	canyon side slope	30-80	colluvium, sandstone and shale	shallow to moderate deep	sl, l, cl	very stony to bouldery	Douglas-fir Pinion Mt. Mahogany
G	DCP	steep canyon slope, south aspect	30-80	sandstone, shale and colluvium	shallow to moderate deep	sl, l, cl	very stony to non-stony	Pinion-Juniper Grass

Seven soil samples were selected from representative soil layers during soil inventory and were characterized according to the State of Utah Division of Oil, Gas and Mining (DOGM) guidelines for topsoil and overburden[1]. Sampled parameters include: pH; electrical conductivity; saturation percent; SAR includes Ca, Mg, and Na; texture includes % very fine sand, sand, silt and clay; TOC includes organic matter percent; $CaCO_3$; Boron ($CaCl_2$ extraction); Selenium (AB-DPTA extraction); AWC includes 1/3 and 15 bar analyses; and ESP.

[1]Leatherwood, James and Dan Duce. 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

Soil samples were sent to Inter-Mountain Laboratories, Inc. for analysis. Appendix B contains the laboratory data sheets for all analysis on the seven samples. Some summaries of soil laboratory results are noted below, excluding sample CW10-1 which is discussed below:

Parameter	Results (Range)	DOGM Rating *
pH	7.4 - 7.8	Good
EC (mmhos/cm)	0.33 - 0.64	Good to Poor
Saturation %	30 - 48	Good
SAR	0.3 - 0.7	Good
Texture	SIL, SL, L	Good
Boron (mg/Kg)	0.5 - 1.6	Good
Selenium (mg/Kg)	<0.02	Good
Avail Water Cap. (in/in)	0.06 - 0.14	Fair to Good

* State of Utah Division of Oil, Gas and Mining (DOGM) guidelines for topsoil and overburden.

For all soils, except CW10-1, soil tests indicate that the soils generally rate fair to good for reclamation use. The one exception is soil sample CW10-1, which was taken from a light-colored soil layer at about 20 to 30 inches in depth on a road cut in Soil Map Unit F. The sample was taken to document properties of a calcic horizon in a Guben soil. Soil test results indicate an unacceptable level of selenium (0.26 mg/Kg) and a poor rating for electrical conductivity (10.2 mmhos/cm). The sample was also higher in boron (2.5 mg/Kg), calcium (7.5 meq/L), magnesium (160 meq/L), sodium (35 meq/L), SAR (3.7) and pH (8.3) than the other soil samples. The CW10-1 sample site is at the edge of the existing road accessing the future portal site. The soil survey states that Co-Op Mining does not anticipate that this soil would be involved in site disturbance for portal development and that further assessment may be required if disturbance along this section of road is proposed. Every effort should be made to minimize disturbing and/or mixing the deeper subsoils (20 to 30 inches) of this section of road cut.

The **percent rock content** within the mine site disturbance or proposed facilities area is the main deterrent for soil suitability based on the current DOGM guidelines. Although DOGM suitability criterion considers >30% (by volume) rock fragments (for both gravels <3" in size and cobbles 3 to 10" in size) to be unacceptable, and >10% stones and boulders >10" in size to also be unacceptable, the recent trend by DOGM is to salvage **native soils** with **intrinsic or indigenous rock content.** Using indigenous rocky soils should enhance reclamation success by providing an environment similar to native conditions. However, higher rock content greater than is present in the surface soils needs to be avoided. Natural, intrinsic rock content provides

for a more stable reclaimed surface, aids in water harvesting and water holding capacity of interstitial soils, and creates wildlife habitat and niches on the surface were surface boulders and larger cobble sized rocks are placed.

Substitute Topsoil

The PAP does not propose any borrow as a source for substitute topsoil. However, in 1992, in-place overburden and disturbed soils within the facilities area, were evaluated for use as substitute topsoil material. Results are contained in Appendix 8-E.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

LAND-USE RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.22; R645-301-411.

Analysis:

According to information in the application and the current mining and reclamation plan, the current permit area and the proposed addition are zoned by Emery County as Mining and Grazing and Critical Environmental. The land is used for mining, cattle grazing, timber, recreation, and wildlife. Parts of the area are included in a Private [Posted] Hunting Unit, and the access road to the Wild Horse Ridge surface facilities also provides access to a hunting cabin. This road will be maintained during the mining operations.

The application discusses previous mining activity in the area. Various entities have operated mines in the area since 1885.

The application says there are no public parks, cemeteries, or units of the Wild and Scenic Rivers system or the National System of Trails.

Findings:

Information in the application is adequate to meet the requirements of this section of the regulations.

ALLUVIAL VALLEY FLOORS

Regulatory Reference: 30 CFR 785.19; 30 CFR 822; R645-302-320.

Analysis:

Alluvial valley floor determination

The proposed addition to the permit area does not contain alluvial valley floors as defined in R645-100. It is primarily an upland area with grazing and wildlife habitat land uses. Deposits are mostly colluvial with some water-laid deposits from sheet flow and other unconcentrated runoff events.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

PRIME FARMLAND

Regulatory Reference: 30 CFR 785.16, 823; R645-301-221, -302-270.

Analysis:

A Prime Farmland site investigation was performed by the Natural Resources Conservation Service (NRCS). A negative determination was made for Prime Farmland or farmland of statewide importance within the proposed Wild Horse Ridge area (sections 24 and 25 T.16S. R. 7E. and sections 19 and 30 T.16S. R. 8E). The determination letter from the NRCS is dated July 9, 1999, and is included in Appendix 8-C.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

GEOLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR 784.22; R645-301-623, -301-724.

Analysis:

Changes to the text, mostly minor, have been made on pages 6-3, 6-6, 6-10, 6-11, 6-13, 6-16, 6-18, and 6-19 of Chapter 6. The proposed permit boundary as shown on revised Plates 6-1 through 6-12 includes federal leases U-020668 and U-38727 and fee coal owned by C.O.P. Development. Plate 6-1 is the Geology Map. Plates 6-2, 6-6, and 6-10 are overburden maps, Plates 6-3, 6-7, and 6-11 are isopach thickness maps, Plates 6-4, 6-8, 6-12 are structure contour maps, and Plates 6-5 and 6-9 are interseam isopach maps. Plates 6-2 through 6-12 are based on information from numerous borings and outcrop measurements: logs from many of these borings are in the MRP.

Plates 7-9 and 7-9A are stratigraphic cross-sections. Generalized logs for bore-holes T-1, T-2, T-3, T-5, SDH-1, SDH-2, and SDH-3 are shown on Plate 7-9 and those for WHR-1, WHR-2 , WHR-3, WHR-5, WHR-8, F-76-1, F-77-5, F-76-6, 77-3A, and F-77-11-A are on Plate 7-9A. The logs are not arranged on Plate 7-9A in a sequence that would usually be expected of a geologic cross section. 7-J1 and 7-J2 are stratigraphic cross-sections based on logs from bore holes SDH-1, SDH-2, MW-116, and MW-117. Well completion diagrams for SDH-1, SDH-2, SDH-3,MW-116, and MW-117 are in Appendix 7-A, but the MRP does not contain original logs for any of these bore holes. The well completion diagram for MW-114 has been submitted for inclusion in Appendix 7-A. Except for F-76-4 and F-77-B (Plate 7-9A), Plate 6-2 shows the locations for all bore-holes on Plates 7-9, 7-9A, 7J-1, and 7J-2.

Appendix 7-A also contains logs for in-mine drill-holes 1- and 2-UP and 1-, 6-, 7-, 9-, 10- , 11-, 12-, 13-, and 14-DOWN and SBC-2, -3, and -4, but locations for these are not on a map. Locations for an "H" series of in-mine bore holes are shown on Plates 6-5 and 6-7, but there are no logs for these holes in the MRP.

Drill-hole DH-3 was abandoned in 1993 and replaced by DH-4. Bore-hole logs and well completion diagrams for DH-1, DH-2, DH-3, and DH-4 are in Appendix 7N-G (p. 6-13).

Logs for drill holes TS-6 through TS- 10 and TS-14 are in Appendix 6-A, but logs are not available for TS-12 and TS-13: there is apparently no TS-11. Locations for TS-6 through TS-10 are shown on Plates 6-9, 6-10, and 6-11.

There is no hydrology information available for the "WHR" series of bore-holes (Section 7.1-4, p. 7-20).

The current MRP includes a description of the areal and structural geology of the proposed permit and adjacent areas, including federal leases U-020668 and U-38727 and fee coal tract owned by C.O.P. Development. The description is based on maps and plans required as resource information for the plan, detailed site specific information, and geologic literature and practices. Additional geologic information has been submitted as part of Appendix 7J-I, Investigation of Groundwater and Surface Water Systems and Probable Hydrologic Consequences, a report by Mayo and Associates, LC. These descriptions show how areal and structural geology may affect the occurrence, availability, movement, quantity, and quality of potentially impacted surface and ground water.

Coal isopach thickness maps indicate the Blind Canyon and Tank seams, but not the Hiawatha seam, are of mineable thickness in portions of the Wild Horse Ridge area. The Hiawatha seam was previously thought to be continuous and of mineable thickness, but recent drilling has revealed several sandstone channels that render the seam unmineable in the vicinity of Bear and Fish Creeks (pp. 6-18 and 6-19 and Plate 6-7) and this seam is described as not mineable in Table 3C-1. Revised Plates 3-4A and 3-4C show projected mining in the Blind Canyon and Tank seams, respectively, in the Wild Horse Ridge addition.

Subsidence is discussed in Appendix 3-C. Total calculated subsidence in the Wild Horse Ridge area is 7.3 feet, based on an average total thickness of 16.5 feet for the Tank and Blind Canyon seams: in the existing permit area, the calculated maximum subsidence is 14.1 feet based on an average total thickness of 22 feet for the Tank, Hiawatha, and Blind Canyon seams (Table 3C-1). Average thickness of the Blind Canyon seam is 9 feet and average depth is 1,200 feet, and for the Tank seam the averages are 7.5 feet thick and 950 feet deep.

The application includes geologic information in sufficient detail to assist in determining the probable hydrologic consequences of the operation upon the quality and quantity of surface and ground water in the permit and adjacent areas, including the extent to which surface and ground-water monitoring is necessary, and determining whether reclamation as required by the Utah Coal Mining Rules can be accomplished and whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.

At this time the Division does not require the collection, analysis, and description of additional geologic information to protect the hydrologic balance, to minimize or prevent subsidence, or to meet the performance standards. The Applicant has made no request to the Division to waive in whole or in part the requirements of the bore hole information or analysis required of this section.

Findings:

Information on geologic resources is considered adequate to meet the requirements of this section.

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

Analysis:

Sampling and Analysis

Holding time and sample analysis problems occurred at sites 16-7-13-1, 16-18-14 and 16-8-20-1. See Tables 2b and 3 in this technical analysis. For surface water site WHR-1, fluoride was not distilled for baseline data on June and August 1993; however, fluoride is no longer considered a required baseline parameter. Holding time expired on sulfate on 10/93. For all samples dissolved metals, which were filtered at lab, were received within one day. Lab sheets for all sites where data was collected in July 1991 were missing from the amendment since they could not be found. However, the data had been recorded and was submitted.

Baseline Information

Appendix 7-M, Spring and Seep inventory Federal Lease Area, provides a discussion of the seeps, springs, and streams in and adjacent to the Wild Horse Ridge addition. Attachment 7M-A, Surface and Groundwater Water Quality Information provides the lab sheets for baseline monitoring. Table 7.1-8, Water Monitoring Matrix: Operational Phase of Mining lists the proposed monitoring plan for the mine, which now includes the new addition. The surface and ground water parameters monitored remain the same as in the original Mining and Reclamation Plan. The plan clearly states that the operational monitoring will continue through reclamation to bond release. Also, the monitoring points are divided into wells, springs, and streams. This is consistent with the PHC, which is formatted in this manner, and is standard practice for coal mines that the Division regulates.

Although included, adjacent area sampling associated with the McCadden Hollow area were not reviewed. This information was not considered to be directly related to the proposed Wild Horse permit area, but will be considered applicable to the Cumulative Impact Area (CIA) information.

Ground-water Information

Numerous sources for ground water related information is found throughout the plan. The baseline information relative to groundwater, seeps, and springs in the proposed Wild Horse Ridge permit are presented in Tables 1, 2 and, 2b in this technical analysis. Data for groundwater well information, identified in Table 1, were collected in 1996 and 1997.

Table-1: Wild Horse Ridge Monitoring Wells*

Well Number	Formation Monitored & Relative Location	Screen Intervals	General Observations
MW-114	Spring Canyon Sandstone -East of the Bear Canyon Fault.	Upper screen interval 1795-1805 ft. Lower screen interval 1819-1829 ft.	Water elevation measured on 8/22/96, 09-24-96 and 10-23-97 varied from 7649.5 to7650.5 feet. Potentiometric water level - approximately 26 ft below Hiawatha Seam.
MW-116	Spring Canyon - East of the Bear Canyon Fault	Upper screen interval 1720-1730 ft. Lower screen interval 1743.3-1753.3 ft.	Water elevation measured on 10/18/95,7/19/96, 09/24/96 and 10/23/97 varied from 7743.9 to7744.5 feet. Potentiometric water level - approximately 71.2 ft below Hiawatha Seam.
MW-117	Spring Canyon - near fault line - East of the Bear Canyon Fault Section 12, T. 16 S. R.7 E.	Upper screen interval 1720-1730 ft. Lower screen interval 1743.3-1759.7 ft.	At 1720 ft. fault gouge and fractured material encountered. Caving continued with out a defined Star Point Formation. Water elevation measured on 10/18/95, 07/19/96, 9/24/96 and 10/23/97 varied from 7746.2 to7746.5 feet. Hiawatha Seam not identified on log.

*Data obtained from Cyprus-Mohrland Project Drill Report

The Wells MW-114 and 117 will be monitored for water level prior to mining the Wild Horse Ridge to verify the existing water elevations recorded at these wells are the same as the elevations obtained during 1996 and 1997. This way, should mining in the Wild Horse Ridge intercept water from a sand channel or other significant in mine flow, the pre-mining status at these wells will not be in question. The Operator commits to collect water age dating and chemical make-up to verify the information found west of the Bear Canyon Fault can be applied to the Star Point Sandstone Formation east of the Fault. This commitment extends to all new wells within and adjacent to the Wild Horse Ridge area. See pg.7-34.

Spring Data

Spring sampling was conducted for the Wild Horse Ridge lease addition and adjacent area as summarized in Table 2 below. Information on springs within and adjacent to the Wild Horse Ridge area include springs WHR-2, WHR-3 and WHR-4. Spring WHR-4A was included in the Probable Hydrologic Consequence document and on a map, but there was no flow recorded for that location (Figure 1, Mayo and Associate Report, August 1999). Spring identification labels have been clarified by providing both labels on Plate 7-4, Water Monitoring and a cross reference table is included in Appendix B of the Mayo and Associates Report. In addition, Table 1 includes a legend of geologic formation abbreviations, and Figure 15 includes the geologic structure for the various stiff diagrams.

Table 2: Baseline Spring Sampling Wild Horse Ridge Mayo Report

Site/Location	No. Data Samples sampling period	Geology	Flow rate (gpm) Min/Max
WHR-2 Fish Creek LF-East	7 7/31/91 - 8/30/94	Tf-TKnh	0.2/20
WHR-3 Head Fish Creek	8 7/30/91 - 10/31/94	Tf	0.5/70
WHR-4/SBC-13/SBC-16 Fish Creek LF-West	8 7/30/91 - 10/31/94	Tf-TKnh	0/65
WHR-5/SBC-15 Bear Canyon RF (above coal outcrop)	8 7/31/91 - 10/30/94	Tf-TKnh	0.0/17
WHR-6/SBC-14 Bear Canyon RF (near disturbed area)	8 10/26/93 - 6/24/97	Kbh	0.5/15
WHR-7 Fish Creek LF- West	1 7/30/91	Kbh	40
WHR-8 Wild Horse Ridge	1 7/31/91	Kbh	5
16-7-24-3 Bear Canyon Cliff Face	1 3/17/99	Kbh	no flow reported- chemical analysis obtained
16-7-24-4/SBC-17 Bear Canyon Fault	1 3/17/99	Kbh	no flow reported- chemical analysis obtained

Tf- Flagstaff Formation
TF-TKnh- at the contact between the Flagstaff and North Horn Formation
Kbh-Black Hawk Formation

Table 2b: Baseline Spring Sampling Wild Horse Ridge

Site/Location	Date				Comments
	1st Q	2nd Q	3rd Q	4th Q	
WHR-2 1991			7/31/91		Left Fork Fish Creek east side
1992				10/28/92	dry 10/31/94
1993					
1994		6/24/93	8/15/93	10/13/93	
1997		5/30/94	8/30/94	10/31/94	
		6/25/97	9/10/97	10/20/97	
WHR-3 1991			7/30/91		Head waters of Fish Creek
1992				10/27/92	Fluoride not distilled 10/92, 6/93, 8/93.
1993		6/24/93	8/15/93	10/13/93	Holding time expired on Ortho Phosphate
1994		5/30/94	8/30/94	10/31/94	10/13/93.
1997		6/25/97	9/10/97	10/20/97	Dissolved metals filtered at lab received within a day.
					Sample > 6 deg C on 10/94.
WHR-4 1991			7/30/91		Left Fork Fish Creek west side.
1992				10/28/92	03/93, 03/94 not accessible.
1993	03/22/93	6/24/93	8/15/93	10/13/93	Fluoride not distilled 10/92, 6/93, 8/93.
1994	03/30/94	5/30/94	8/29/94	10/31/94	Holding time expired on Ortho Phosphate
1997		6/24/97	9/10/97		10/13/93.
					Dissolved metals filtered at lab receiv within a day.
					Sample > 6 deg C on 10/94.
WHR-5 1991			7/30/91		Right Fork - Left Fork Bear Canyon
1992				10/28/92	03/93, 03/94 not accessible.
1993		6/24/93	8/15/93	10/13/93	Fluoride not distilled 10/92, 6/93, 8/93.
1994		5/30/94	8/29/94	10/31/94	Holding time expired on Ortho Phosphate
1997		6/24/97	9/10/97	10/20/97	10/13/93.
					Dissolved metals filtered at lab received within a day.
					Sample > 6 deg C, on 10/94.
WHR-6 1993				10/26/93	Right Fork - Right Fork Bear Canyon
1994	3/23/94	6/01/94	8/28/94	10/26/94	03/94 not accessible.
1995		5/24/95	8/22/95		Holding time expired on Sulfate 10/93.
1997					Possible matrix interference with Cl-6/94.
		6/24/97	09/18/97	10/28/97	Possible matrix interference with Nitrite-10/94.
					Possible matrix interference with Selenium-5/95.
					Dissolved metals filtered at lab received within a day.
					Sample > 6 deg C, on 8/95.

The Mayo Report discusses spring discharge rates by formation using a calculated R-value which is the sum of the minimum flows, over the sum of the maximum flows for all

springs issuing from the formation. This analysis provides a generalized description for the formation while individual R-values for springs within the formation may vary from the generalized description. Data used for the springs do not have a continuous record; therefore, high and low flow data is not represented for each year within the period of record (1991 to 1999). The climate, from 1991 to 1999, consisted of the end of a 4 year long dry spell, moving into short periods of moderately to severely wet climate disrupted by intermittent dry periods (Region 4 and 5 drought index). Some data used in the analysis may be influenced by historic mining activities. Although the Mayo Report states that Figure 6a and 6b represent the maximum and minimum discharge rates from each formation, the data record is not continuous enough to support this statement. However, the general high and low flow pattern for these formations is probably representative.

Surface Water Information

The Mayo Report identifies Trail Creek, Bear Creek, Fish Creek and Lower Cedar Creek as perennial. The upper Trail Creek, Mc Cadden Hollow, Blind Canyon, and Upper Cedar Creek are intermittent or ephemeral.

Baseflow to Lower Trail Creek was attributed to be sustained by flow from springs in the area, especially TS-1. Baseflow appears to be about 25 gpm for the period of record until mid 1995 where baseflow appears to increase. Baseflow to Bear Canyon Creek is estimated to be about 30 to 50 gpm and is attributed to be sustained from springs such as FBC-12, emerging from the North Horn Formation.

According to the PHC, Fish Creek is a perennial stream. During 1996 and 1997 low flow was 15 gpm in Fish Creek in both the Left and Right Forks. These drainages may become intermittent during periods of prolonged drought.

Baseline Cumulative Impact area Information

Adjacent area information is included within this permit application package for areas where future mining is likely to occur.

Table 3: Baseline Stream Sampling Wild Horse Ridge

Site/Location		Date				Site Flow Rates (gpm)	Comments
		1st Q	2nd Q	3rd Q	4th Q		
CK-1 (not on Map)			06/94 06/95 07/96		10/94 10/95 10/96	Max 1104 Min 103 Average 666	Field data only. No sample date.
CK-2 (not on Map)			06/94 06/95 07/96		10/94 10/95 10/96	Max 950 Min 4 Average 241	Field data only. No sample date.
LF-1	1994 1995 1996		06/09/94	 07/10/95 07/16/96	10/27/94 10/18/95 10/15/96	Max 266 Min 15 Average 68.5	
RF-1	1994 1995 1996		06/09/94	 07/10/95 07/16/96	10/27/94 10/18/95 10/15/96	Max 191 Min 15 Average 66.5	
WHR-1	1991 1992 1993 1994 1997	 03/29/93 03/23/94	 06/24/93 06/01/94 06/29/97	07/31/91 08/15/93 08/29/94 09/17/97	 10/28/92 10/26/93 10/30/94	Max 650 Min 0 Average 89.0	No access on 03/93. Dry 08/94. No flow recorded 10/28.

Modeling

Modeling is not proposed to be used instead of data acquisition.

Alternative Water Source Information

No additional information on alternative water sources was presented in this amendment.

Probable Hydrologic Consequences Determination

The probable hydrologic consequences determination is provided in Mayo and Associates, LC, "Investigation of Groundwater and Surface Water Systems in the C. W. Mining Federal Coal Lease and Fee Lands; Southern Gentry Mountain; Emery and Carbon Counties, Utah; Probable Hydrologic Consequences of Coal Mining in the Bear Canyon Mine Permit Area and Recommendations for Surface Water and Ground Water Monitoring" August 1999. Pertinent portions from this determination will be used to update the CHIA and complete technical directives process at Birch Spring and Big Bear Spring.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.24, 783.25; R645-301-323, -301-411, -301-521, -301-622, -301-722, -301-731.

Analysis:

Affected Area Boundary Maps

The applicant did not give the Division a map that identifies the affected area boundaries. The Division usually assumes that the permit and affected area boundaries are the same unless otherwise noted. Information in the application suggests that the permit area and affected area boundaries are the same. The applicant did give the Division a permit boundary map, Plate 2-1. The Division found Plate 2-1 to be adequate.

Archeological Site Maps

There are various reports in Chapter 5 that contain maps showing the areas that were surveyed for archaeological sites.

Cultural Resource Maps

Other than archaeological sites, there are no cultural resources in the area.

Existing Structures and Facilities Maps

The only existing structure in the Wild Horse Ridge area mentioned by the applicant is a hunting cabin and the access road. Both are shown on Plate 2-4G and Plate 3-7G. The hunting cabin is labeled on Plate 3-7G, and an outline of the building is shown.

Existing Surface Configuration Maps

Plate 3-7F and Plate 3-7G, show the existing surface topography. The hunting cabin is not labeled but an outline of the building is shown on Plate 3-7G.

Mine Workings Maps

The applicant gave the Division maps that show the mine workings in the Blind Canyon Seam, Plate 3-4A, and the Tank Seam, Plate 3-4C.

Monitoring Sampling Location Maps

Plate 7-4, Water Monitoring, shows nearly all the monitoring location proposed in Table 7.1-8, Water Monitoring Matrix; Operational Phase of Mining. Sites SBC-3 and MW-117 could not be shown due to the scale of the map; however, they are shown on Plate 7N-2, Water Sample Locations.

Permit Area Boundary Maps

Plate 2-1, Permit Area, shows the location of the permit boundaries. The Division addressed the permit boundary maps in the permit area section of this technical analysis.

Surface and Subsurface Ownership Maps

Plate 2-1, Permit Area, shows the location of the permit boundaries. The Division addressed the permit boundary maps in the permit area section of this technical analysis.

Surface and subsurface manmade features maps

Plate 2-2 shows the surface ownership with the permit boundaries for the Wild Horse Ridge area. Plate 2-3 shows the subsurface ownership with the permit boundaries for the Wild Horse Ridge area.

Surface Water Resource Maps

Water rights have been updated on Plate 7-4. A check of the Utah Division of Water Rights Internet page shows the appropriate water rights have been shown on the map.

Vegetation Reference area Maps

The revegetation reference area is shown on Plate 9-1.

Contour Maps

There are several maps that show the topography for the entire permit boundary, such as Plate 7-4, Water Monitoring. Plate 3-7F and Plate 3-7G show premining contours. Plate 3-7G shows the premining contours extending 100 feet beyond the disturbed area boundaries. Plate 3-2G shows the postmining contours extending 100 feet beyond the disturbed area boundaries.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

OPERATION PLAN

MINING OPERATIONS AND FACILITIES

Regulatory Reference: 30 CFR 784.2, 784.11; R645-301-231, -301-526, -301-528.

Analysis:

General

In Section 3.4 the application says, "Co-Op started its mining operating through an existing mine in the Blind Canyon Seam and later extended into the Hiawatha seam below. Access to the Hiawatha Seam was made in the summer of 1986 through two new portals in the outcrop, and through a rock slope tunnel from the Blind Canyon seam. In 1995, Co-Op extended operations into the Tank Seam, located above the Blind Canyon seam. In 1999 (2001), Co-Op plans to extend operations into the Blind Canyon and Tank Seams East of the Bear Canyon Fault. The four main seams in the Bear Canyon property are, the Tank seam, the Bear Canyon seam, Blind Canyon seam and Hiawatha seam. The applicant does not plan to mine the upper Bear Canyon seam due to the proximity of the seam to the Blind Canyon Seam (0.30 feet interburden). Nor do they plan to mine the Hiawatha Seam in Wild Horse Ridge due to the thinning of the seam. The mine plan, sequence and projected development for the Bear Canyon, Hiawatha and Tank seams are shown on Plate 3-4A, 3-4B and 3-4C respectively."

Type and Method of Mining Operations

In Section 3.4.1.2 the applicant says, "The mining at the Bear Canyon complex is done by continuous miners. The miners discharge into shuttle cars (diesel or electric), which carry the coal to a feeder breaker. The feeder breaker discharges the coal onto the belt conveyor where it is taken out of the mine." The mining methods are consistent with the proposed surface facilities expansion. If market conditions warrant, annual production will reach 1,100,000 tons per year.

Facilities and Structures

A list of new structures associated with the Wild Horse Ridge is given in Appendix 3A. The new structures are shown on Table 3A-1, in Appendix 3A. The new structures include a conveyor belt, substation, shop building, water tank and fuel tank. See the Support Facilities and Utility Installations section of this technical analysis for more details.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

EXISTING STRUCTURES:

Regulatory Reference: 30 CFR 784.12; R645-301-526.

Analysis:

The application states that the only existing structure in the mineable portion of the permit area consists of a hunting lodge that exists in the Wild Horse Ridge area. The hunting cabin is shown on Plate 2-4G.

A road exists in the permit area that allows access for property owners and the Forest Service. That road is a permanent feature that will remain after mining.

Findings:

Information provided in the amendment is adequate to meet the regulatory requirements for this section.

PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES

Regulatory Reference: 30 CFR784.17; R645-301-411.

Analysis:

The Bear Creek Shelter is the only known cultural resource in the proposed addition to the permit area that is eligible for listing in the National Register of Historic Places. This site is not within the proposed disturbed area. In the lower part of the canyon where this shelter is, the conveyor is on the other side of a ridge and the road is on the other side of the canyon. For these reasons, there is little likelihood for accidental disturbance.

The Division has received a letter from the State Historic Preservation Office concurring with the Division's determination that no historic properties would be affected based on avoidance of the Bear Creek Shelter.

Findings:

Information in the proposal is adequate to meet the requirements of this section of the regulations.

RELOCATION OR USE OF PUBLIC ROADS

Regulatory Reference: 30 CFR 784.18; R645-301-521, -301-526.

Analysis:

No public roads exist in the Wild Horse Ridge area. However, the Bear Canyon haul road and the No. 3 Mine Access road are also used by customers of Sportsman's Hunting to access a hunting cabin that exists in the right fork of Bear Canyon. Hunters will use the road primarily from May to November, typically 2-3 times per week.

A road can be defined as a public road if there is more than incidental use by the public. The term incidental use is not defined but is left to the discretion of the Division. The Division considers the use of a road 2-3 times per week for seven months by a hunting club's members incidental because (1) the general public does not access the area because of the step canyon slopes that limit recreational activities that can be accessed by the road and (2) hunting club members will use the cabin less than 100 times per year.

Findings:

Information provided in the amendment is adequate to meet the regulatory requirements for this section.

AIR POLLUTION CONTROL PLAN

Regulatory Reference: 30 CFR 784.26, 817.95; R645-301-244.

Analysis:

The regulations require the applicant to show its coordination efforts with the Division of Air Quality, and the application contains a copy of the Air Quality Approval Order.

Findings:

Information in the application is adequate to meet the requirements of this section of the regulations.

COAL RECOVERY

Regulatory Reference: 30 CFR 817.59; R645-301-522.

Analysis:

The applicant gave the Division a general commitment to maximize coal recovery. Most of the information in the resource recovery and protection plan is contained in the mining and reclamation plan. The applicant plans to mine the coal using room and pillar methods. The projected coal recovery rate is between 70% to 80% of the mineable coal. The Division reviewed the mine maps and other information in the permit application package about coal recovery and found that the applicant is planning to maximize coal recovery.

The Division defers to the BLM for a determination of maximum economic recovery for federal coal. Before the applicant can begin mining, the mining plan must be approved by the Bureau of Land Management (BLM). **The R2P2 is still being reviewed by the BLM and the determination of** maximum economic coal recovery is still pending. **Prior to mining in the federal leases the permittee must receive federal mine plan approval which includes approval of the R2P2. This should be stipulated in the permit.**

Findings:

The following stipulation should be added to the permit:

Underground coal mining and reclamation activities in federal coal leases U-038727 and U-0020668 may not commence until a mining plan approval is authorized by the Secretary of the Interior..

SUBSIDENCE CONTROL PLAN

Regulatory Reference: 30 CFR 784.20, 817.121, 817.122; R645-301-521, -301-525, -301-724.

Analysis:

Renewable Resources Survey

The applicant and the Division found that renewable resources exist within the Wild Horse Ridge mining unit. The Division is concerned that subsidence could: impact ground and surface water, that large subsidence cracks similar to those that occurred on the Bear Canyon Ridge could also occur in the Wild Horse Ridge area, and that escarpment failure could damage

or destroy eagle nests. Since renewable resources were found in the area, the applicant must develop a subsidence control plan.

Subsidence control Plan

- The applicant proposes to use room-and-pillar mining to extract all the coal in the Bear Canyon complex. The applicant expects to recover 75% of the coal in full extraction areas and 50% in first mining areas. The sequence and timing of mining is shown on the mine maps 3-4A, Blind Canyon Seam (lower), and 3-4C, Tank Seam (upper). No mining is scheduled for the Hiawatha Seam in the Wild Horse Ridge project. Subsidence should not occur in first mining only areas but should occur in areas where second mining (pillar recovery) occurs.

- The applicant shows the underground workings for the Blind Canyon Seam (lower) on Plate 3-4A and the Tank Seam (upper) on Plate 3-4C. Plate 3-3 shows the projected subsidence for the Wild Horse Ridge project. Plate 3-4A and Plate 3-4C show the projected subsidence for each seam.

- Plate 3-3, Subsidence Map, shows the subsidence protection areas that include escarpment areas. Plate 3-4C shows where pillars will be left as part of the subsidence protection zone.

- The applicant shows where second mining (pillar recovery) will occur on the mine maps. Areas marked panel or development will be first mined only. Areas that will be second mined are identified as pillar and development.

- The descriptions of the physical conditions that affect the likelihood or extent of subsidence are addressed in the geologic section of the technical analysis.

- The applicant described the monitoring program in Appendix 3C in Section 5 of the amendment. The applicant committed to installing 26 monitoring points in the Wild Horse Ridge area. The stations will be monitored yearly plus they will conduct an annual on the ground survey to look for subsidence effects. The subsidence monitoring program is similar to the existing program that has proved to be adequate.

- The applicant proposes to protect sensitive surface features from subsidence by first mining only. The protected areas are marked on the Plate 3-3. The pillars in the subsidence protection zones have safety factors of 1.5. The applicant quoted references indicating subsidence should not occur if the pillar safety factor is at least 1.5. The reference is a NIOSH publication which the applicant included in the application.

- The estimated amount of subsidence in the Blind Canyon Seam is 3.2 feet and

subsidence in the Tank Seam is 4.1 feet. The maximum amount of subsidence in the Wild Horse Ridge area is 7.3 feet.

The applicant described the measures that will be taken to mitigate or remedy any subsidence-related damage. The main item of concern is water replacement. The applicant committed to purchase either water rights to replace damaged water right, or to repair damage to existing rights. Should subsidence cracks occur, the applicant will fill those cracks to the extent practical.

Performance Standards for Subsidence control

The applicant is required to meet the performance standards for subsidence control.

Notification

The applicant is required to meet the performance standards for subsidence control.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

SLIDES AND OTHER DAMAGE

Regulatory Reference: 30 CFR Sec. 817.99; R645-301-515.

Analysis:

In case of a slide or other damage, the applicant committed to notify the Division by the fastest possible method. The applicant will repair the damage. If the applicant is unable to determine the best way of repairing the damage, they will wait for the Division to recommend a repair plan.

Findings:

Information provided in the amendment is adequate to meet the regulatory requirements for this section.

FISH AND WILDLIFE INFORMATION

Regulatory Reference: 30 CFR Sec. 784.21, 817.97; R645-301-322, -301-333, -301-342, -301-358.

Analysis:

Protection and Enhancement Plan

Subsidence is not likely to adversely affect critical big game habitat, but the disturbed areas would be lost during the life of the mine. The applicant is required to use the best technology currently available to protect and enhance wildlife habitat. On March 13, 2001, a Division representative spoke with Chris Colt, (habitat biologist for the Division of Wildlife Resources). They agreed that for this project only (the disturbance associated with the Wild Horse Ridge application), the mitigation at a ratio of three acres of enhanced habitat for each acre disturbed would not be required. The deer and elk in that area tend to winter and feed on the exposed ridge faces above the proposed disturbed area.

Because the surface disturbance would be in critical winter range, construction should not be started in the winter months from about November 1 until April 15. The applicant has committed to consult with the Division of Wildlife Resources prior to construction.

The application has been revised to contain more design information about the conveyor. Conveyors can inhibit big game movements, and although deer and elk are known to cross under conveyors, they usually need at least three feet of clearance. The most common deer and elk movements in the winter are along ridges, but there is some movement through canyon bottoms and up and down the sides of canyons. The conveyor has been designed to not overly restrict these movements providing a minimum of three feet of clearance.

Endangered and Threatened Species and Bald and Golden Eagles

On December 21, 1999, two Division representatives met with Chris Colt of the Division of Wildlife Resources and with the applicant's representative to discuss eagle nests in the area. It was decided nesting birds could be adversely affected if construction was begun during the nesting season and if any of the nearby nests was active. Therefore, construction should be started outside the nesting season, February 1-August 15, unless monitoring shows the nests are not active. If construction or mining has already begun when the nesting season starts, the birds would have the opportunity to judge whether they can accept the disturbance and nest or if they should go elsewhere.

The Fish and Wildlife Service recommended constructing two or three nearby alternate nests at least one-half mile from human disturbance areas. In a telephone conversation, a Wildlife Resources representative suggested a better alternative might be to do some habitat

manipulation to increase the prey base, mainly jackrabbits and cottontail rabbits. This could be done in a degraded pinyon/juniper area and could be in conjunction with the mitigation for loss of big game habitat. A Fish and Wildlife Service representative agreed, again by telephone, that this would be an acceptable choice but suggested the applicant could do a combination of artificial nest sites and habitat manipulation. The applicant has committed to develop a mitigation plan. On March 6, 2001 Division representatives Susan White, Paul Baker and Joe Helfrich met with Charles Reynolds from Co-Op Mining Co. and Chris Colt, habitat biologist for Wildlife Resources. Dianna Whittington, ecologist for the Fish and Wildlife Service, was not present but, according to Mr. Colt, had concurred with Wildlife Resources regarding the development of a prey base study as mitigation to raptor displacement. Mr. Reynolds agreed to have a consultant prepare a proposal pending the development of the goals and objectives of the study by Mr. Colt. Since then, Mr. Reynolds has contracted the services of a consultant to conduct a prey base study. Wildlife Resources conducted a raptor survey on May 17, 2001. The consultant will then evaluate the status of any active nests and finalize a proposal to be presented to Wildlife Resources, the Forest Service, the Division, and the Fish and Wildlife Service. Once approved, Co-Op needs to implement the plan.

The mine plan has been designed so no mining that would cause subsidence is planned for any areas under known raptor nests.

As discussed in the wildlife information section of this review, no proposed or listed threatened or endangered species is known to have habitat in the proposed addition to the permit area; however, the mine has potential, through water depletions, of adversely affecting four listed threatened and endangered fish species of the upper Colorado River drainage. The Fish and Wildlife Service requires mitigation when water depletions exceed 100 acre-feet annually. According to information in Section 3-3.6, the total estimated water requirements will be 0.05 cubic feet per second or 36.2 acre-feet annually. Therefore, no mitigation is required.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations. The Division finds, and the Fish and Wildlife Service concurs, that the proposed action will have no adverse effects on any listed or proposed threatened or endangered species with the possible exception of four listed fish species of the upper Colorado River basin which could be adversely affected through water depletions. However, because the water depletions are less than 100 acre-feet, no mitigation is required.

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

Analysis:

Chapter 8, Soil Resources, Section 8.8, Removal, Storage and Protection of Soils, and Section 8.9, Selected Overburden Materials or Substitutes, and Appendix 3O, Wild Horse Ridge are all pertinent to the discussion of the plan for topsoil salvage and protection during operations of the proposed Wild Horse Ridge area. Five tables in the plan for the Wild Horse Ridge area are also key to the discussion of soil salvage activity:

Table 8.9-3 Summary Table
Table 8.3-2, Soil Unit Acreage Within the Disturbed Area,
Table 8.9-1, Reclamation Area Summary, and
Table 8.11-1, Final Grading Test Sample Density.
Table 3O-1, Summary of Cut and Fill Volumes

The applicant considers the Summary Table 8.9-3 as being the most accurate table in the plan.[2] All other Tables must reconcile with this one. Table 8.3-2 divides recontour acres by soil type, with soils PC, WIN, WR, DON, DG, GP, DCP being located within the 3.6 acre Wild Horse Ridge disturbance. Table 8.9-1 divides recontoured areas by designated operational areas. Table 8.9-1 divides the recontoured areas by disturbed area. Tables which include disturbed acreage values all agree that the total disturbed acreage for Wild Horse Ridge is 3.6 acres.

This discussion of operational practices will cover the following topics:

- Topsoil and Subsoil Removal
- Topsoil Substitutes and Supplements
- Topsoil Storage

Topsoil and Subsoil Removal

Topsoil Salvage Volumes

Topsoil salvage areas are identified on the Soil Suitability Map C, Appendix 8-F, Order 1 Soil Survey. Cut and fill volumes are located in Table 3O-1 of Appendix 3-O, Wild Horse Ridge Blind Canyon Seam Pad and Conveyor Access Roads.

[2]Personal communication with Charles Reynolds during site visit 3/23/01.

Table 3O-1 shows 8,700 CY of topsoil salvaged from the lower conveyor access road (1,669 CY), the upper conveyor access road (2,171 CY), and the Blind Canyon seam portal pad (4,860 CY). This soil will be stored in wooded area between the proposed lower conveyor access road and the right fork of Bear Creek as shown on Plate 8-7, WHR Topsoil Stockpile and Plate 7-1F, Hydrology Map.

Section 8.9.6 indicates that the soil below the stockpile (Doney soil, map unit D) could provide an additional 2, 354 CY of topsoil during reclamation. This soil additional soil is included in the summary Table 8.9-3 as being available. Therefore, the sum total provided for Wild Horse Ridge in Table 8.9-3 (11, 054 cubic yards) is 2,354 cubic yards more than that itemized in Table 3O-1. Table 3O-1 itemizes 8, 700 cubic yards of topsoil will be recovered as does the narrative on page 8-41.

Table 8.3-2 projects that approximately 11,049 CY of soil will be salvaged from all the Wild Horse Ridge area. The Division arrived at the 11,049 CY figure by multiplying the "acreage with topsoil recovered" column by the "estimated topsoil depth column" for soils with symbols PC, WIN, WR, DON, DG, GP, DCP (see Table below). This approximation of 11,049 includes the Doney soil which will be buried under the WHR topsoil pile. This approximation is within 5 yards of the 11,054 CY of topsoil stated in Table 8.9-3, the difference is probably due to rounding errors.

Wild Horse Ridge Topsoil Areas and Available Salvage Volumes

Soil Map Unit	Estimated Salvage (inches)	Total Disturbance Acres	Potential Volume (yd^3)	Projected Salvage Acres	Projected Volume (yd^3)
PC	12	0.53	1,097	0.41	661
WIN	15	2.45	4,255	0.52	1,049
WR	10	0.72	968	0.50	670
DON	40	0.45	2,312	0.43	2,310
DG	30	1.71	7,058	1.44	5,808
GP	10	1.16	1,560	0.08	107
DCP	15	0.28	383	0.22	444
Total		7.30	17,633	3.60	11,049

In Table 8.9-1, reclamation areas for the Wild Horse Ridge are labeled TS-12, TS-13, TS-14, and TS-15. Table 8.9-1 itemizes the acreage to be reclaimed within each area and acreage to be graded within each of these areas. According to Table 8.9-1, areas TS-12 through TS-15 will add 7.3 acres of total area to the permit. All of the 7.3 acres will be reclaimed, however, only 3.6 acres will require recontouring during reclamation. The difference is due to:

1. The Wild Horse Ridge access road, 3.04 acres of which is pre-existing; and
2. The lower conveyor belt access road, 0.36 acres of which will not require grading during final reclamation; and
3. The upper conveyor belt access road, 0.3 acres of which will not require regrading during final reclamation.

Re-contour acres agree with projected soil salvage acres for Wild Horse Ridge. Table 8.9-1 shows re-contouring on 3.6 acres while Table 8.3-2 shows projected soil salvage over 3.6 acres.

The plan states that actual soil salvage depth and resulting volumes may vary according to actual conditions as they are encountered in the field during construction. State regulation R645-301-232.100 is specific in requiring that all topsoil be removed from the area to be disturbed. The plan states that Charles Reynolds or other supervisory personnel approved by the Division will be present during topsoil salvage to instruct equipment operators in the proper techniques of salvage and to ensure that required horizons are removed. Approved supervisory personnel will document topsoil salvage operations, including salvage history, soil salvage areas, soil salvage volumes, and soil placement in the stockpiles.

Subsoil Segregation and Soil Salvage Practices

In several of the soil mapping units the topsoil is less than six inches. State regulations state that if topsoil is less than six inches, the operator may remove the topsoil and the unconsolidated materials immediately below the topsoil and treat the mixture as topsoil. Therefore, the Order I soil survey, Appendix 8-F, shows that topsoil salvage will include the topsoil and the horizon immediately below the topsoil, based upon rooting depth and other criteria established in the Order 1 soil survey soil salvage will be between 10 and 40 inches.

A single elevated report of selenium was noted in Guben-Pathead soil taken from a cutslope near the switchback of the existing Wild Horse Ridge Road. The site of the sample is shown on Map B in Appendix F as CW 10 (20 - 30 inches depth). The road to the No. Mine will be constructed from this in-place material: page 3-7 of the permit application says, "The road base material was analyzed . . . none of the soil investigations revealed any acid- or toxic-forming materials." This statement is not entirely correct as high EC (10.2 mmhos/cm) and elevated selenium (0.26 mg/kg) were reported from 20 - 30 inches in the GP soil. The area of discussion is only 0.08 acres. The top ten inches of this soil will be salvaged and placed in the

topsoil pile. The Division will allow the use of the subsoil as road base because of the very small acreage involved and because the level of selenium identified is within the limit of 0.3 ppm in upland ephemeral drainage as recommended in the soon to be published revised soil guidelines.[3]

Adverse Conditions

Section 8.9.6, Wild Horse Ridge Disturbance, states that topsoil salvage will vary where bouldery material precludes accurate salvage of the specified depths. If bouldery surface areas and otherwise steep areas are accessible to construction machinery, then soils in these same areas are expected to be salvaged. Either steep, rocky surface slopes are safe for constructing cut slopes and likewise soil salvage, or they're not safe for either activity. Likewise, if steep, rocky slopes and extremely bouldery surface materials render themselves suitable for construction and as construction fill using conventional construction equipment, then these same areas and indigenous materials can be rendered suitable for topsoil salvage. Therefore, the plan states that topsoil will be salvaged from all areas accessible by equipment, including bouldery and steep slopes.

Rocks - Boulders and Large Stones

Reference to Robert Davidson's discussion with Jim Nyenhuis (Nyenhuis 1997) concerning salvaging soils with higher rock content has been misrepresented in the Appendix 8-F, Section 2.5, Soil Suitability for Salvage. The general idea is to salvage otherwise suitable soil containing indigenous amounts of rock that are typical within the soil salvage area. The main idea is that native soils with a higher intrinsic rock content than Division guidelines deem acceptable, offer a greater potential for reclamation success as follows:

1. Allow a greater potential for moisture infiltration into the interstitial soils.
2. Provide for a more stable reclaimed surface.
3. Provide additional surface cover in sparsely vegetated areas, thus helping protect against raindrop impact and resulting soil surface erosion.
4. Create wildlife habitat niches.
5. Create micro-climates for plant establishment and vegetation survival.

Topsoil Substitutes and Supplements

Wild Horse Ridge topsoil pile is estimated as containing the 8,700 CY of salvaged soils and 2, 354 CY of soil beneath the pile (in-place) for a total of 11,054 CY of soil. The native, undisturbed soil held in place will be demarcated by permeable fabric strips placed over the soil surface prior placing salvaged topsoil in the stockpile. Co-Op Mining has proposed using the

[3]Burton, Priscilla and Robert Davidson. 2001. Guidelines For Management of Topsoil and Overburden.. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining. This document has been reviewed by academics and regulatory personnel and will be published after review by industry representatives.

additional 2,354 CY of topsoil held in place for other areas during reclamation; therefore, this soil is actually considered soil borrow.

Topsoil Storage

The Section 8.9.6 states that the Wild Horse Ridge topsoil stockpile will be located in the lower section of the right fork of Bear Canyon in the area of soil map unit "DON" (Plate 8-1A). The topsoil stockpile is shown on Plate 2-4F in the lower convergence section between the primary No. 3 mine access roads and the primary conveyor access road No. 1.

The topsoil pile will be located adjacent to a catch basin, which will be created in the ephemeral drainage. The topsoil pile itself will be approximately ten feet in elevation and 20 feet distant from the ephemeral drainage. The topsoil stockpile will be surrounded with a containment berm and protected as discussed in Section 8.8.1.3. Prior to stockpiling salvaged topsoil, permeable fabric strips will be placed over the original soil surface to preserve the location of the contact zone between the native topsoil and the stockpile.

Topsoil stockpile information concerning soil compaction and stockpile size and dimension is provided as follows:

- During topsoil pile construction, soil compaction will be minimized by limiting the extent of equipment traffic and affected area. Where compaction does occur, the compacted material will be ripped and loosened prior to seeding.

- The Wild Horse Ridge topsoil stockpile is detailed on Plate 8-7 which shows the projected stockpile, size, placement, final configuration and cross sections. According to Plate 8-7, typical slopes range from approximately 6:1 for east facing, 2:1 for west facing, 3:1 for north facing, and 2:1 for south facing.

- Appendix 3O, Figure 3O-1 and associated cross sections show the lower conveyor access road and topsoil stockpile. Cross sections showing the topsoil stockpile final configuration and resulting slopes correlate with Plate 8-7.

Shower House Topsoil Stockpile

Prior to construction on the shower house pad, topsoil was salvaged and stockpiled. The final topsoil stockpile consisted of 1200 cubic yards. The Wild Horse Ridge amendment states that Co-Op proposes to relocate this topsoil stockpile to the Wild Horse Ridge topsoil stockpile. Following relocation, As-builts will be submitted updating the MRP.

Tank Seam Access Road Topsoil Stockpile

Topsoil was salvaged and stockpiled from the Bear Canyon Mine Tank Seam access road during construction. Volume of topsoil contained in this stockpile is approximately 1000 cubic yards. During construction of the Wild Horse Ridge area, Co-Op proposes to relocate this topsoil stockpile from the upper storage pad to the Wild Horse Ridge topsoil stockpile. Following relocation, As-builts will be submitted updating the MRP.

Topsoil Salvage and Stockpile Summary

The plan summarizes (Table 8.9-3) available topsoil for the 36.4 acre Bear Canyon Mine site as follows:

Topsoil Stockpile Description	Cubic Yards
Main	1,480
Ball Park	3,400
Shower House Pad	1,200
Tank Seam Road	1,000
Wild Horse Ridge	11,054
Total	**18,134**

Findings:

Information provided in the application is considered adequate to meet the requirements of this section of the regulations.

VEGETATION

Regulatory Reference: R645-301-330, -301-331, -301-332.

Analysis:

The current mining and reclamation plan says the applicant has maintained a commitment to reclaim the unused disturbed areas to the extent of the cover of the natural vegetation on the mine plan area, and Appendix 3G includes a plan for interim revegetation. The seed mixture in Table 3G-1 would be drilled or broadcast seeded followed by application of 1500-2000 pounds per acre of wood fiber hydromulch with a tackifier added. All but one of the species in the seed mix are native to the area, they are all adapted to the site, and they should provide god erosion

protection.

In addition, the applicant commits to monitor interim revegetation sites for five years or until vegetation standards are met. Reseeding would be done if necessary.

Findings:

Information provided in the proposal is adequate to meet the requirements of this section of the regulations.

ROAD SYSTEMS AND OTHER TRANSPORTATION FACILITIES

Regulatory Reference: 30 CFR Sec. 784.24, 817.150, 817.151; R645-301-521, -301-527, -301-534, -301-732.

Analysis:

Road classification system

The roads associated with the Wild Horse Ridge project are all classified as primary roads. Those roads are the existing Wild Horse Ridge road, the extension of the Wild Horse Ridge road to the portal area and the two new conveyor access roads. Note the extension of the Wild Horse Ridge road is referred to in the permit application package as the No. 3 Mine Portal Access Road and the extension of the road to the portal area is called the No. 3 Mine Portals and Pad Area.

The No. 3 Mine Portal Access Road is an existing road 4,850 feet long. The road has an average grade of 10.5% with the steepest grade being 18%. The road existed prior to mining and will be retained for the postmining land use.

The conveyor access roads will provide access to the areas where the conveyor system will be built, operated, and reclaimed. The lower road is approximately 600 feet long and has an average grade of 10%. The upper road is approximately 590 feet long and has an average grade of 19.5%. Those two roads will be reclaimed after mining is completed.

The Division has concerns about the steep grades. However, the Division does not have standards that require gentler grades. For road designs the Division relies heavily on the judgment of the engineer that designed and certified the roads.

The Division does not consider the No. 3 Mine Portals and the Pad Area a road. The Division considers that area as a pad area. Therefore, detailed road designs are not required.

Plans and drawings

Plate 3-5D and cross sections in Appendix 3-O show the road widths and drainages. The roads slope at 2% to ditches that parallel the roads to direct runoff. The cross sections are on 100 foot centers and show cut and fill requirements for both construction and reclamation. The Division will use that information to do bond calculations.

In Appendix 3-O, the applicant shows a detailed plan for the construction and reclamation of the roads. In Section 3.6.12 of the amendment, the applicant gives a detailed reclamation plan for the roads in the Wild Horse Ridge site. Since no material will be down cast, all fill material will either be hauled back to the site or excavated from the fill areas. Because the native material contains large boulders (3' to 5' in diameter), the lifts will be a maximum or 36". The fill will be compacted with earthmoving equipment. The applicant and its consultant do not believe that conventional compaction equipment will work at the site. Therefore, compaction will be done with earth moving equipment.

The Division recommends that the applicant use a maximum lift thickness of 8". The Division is concerned that inadequately compacted slopes could fail. Since the Division does not have any standards that apply directly to lift thickness and the designs have been certified by a licensed professional engineer the Division will not require the applicant to change the maximum lift thickness.

The designs for the main haul road in the No. 3 Mine Portals and Pad Area are in Appendix 3-O. The applicant will reclaim most of the cut slopes. Since some cut slopes do exist in the area total elimination of cut slopes may not be possible.

Performance standards

The applicant committed to repair road damage caused by a catastrophic event as soon as practical. In addition to the above, primary roads will meet the following requirements:

- Primary No.3 Mine Access Road is the main road to the portal area. Certified maps showing the road are Plate 3-5D Road-Details and Plate 2-4G, 2-4F Surface Facilities.

- Primary Conveyor Access Road No.1 is the lower conveyor access road and is shown on Plate 3-5D Road-Details and Plate 2-4F Surface Facilities.

- Primary Conveyor Access Road No.2 is the upper conveyor access road and is shown on Plate 3-5D Road-Details and Plate 2-4G Surface Facilities.

- The cross sections on Plate 3-5D show the road width and drainage. The roads slope at 2% slope and have parallel ditches that direct runoff. The cross sections Attachment 2 of Appendix 3-O show cuts and fills. The Division will use those

cross section to determine reclaimablility, which will be discussed in the reclamation section of this technical analysis.

- Appendix 3-O-6 contains the slope stability study conducted by Dames & Moore. The consultant outlined the soil and rock sampling, procedures and testing. The stability analysis was described. All slopes had a minimum safety factor of 1.6, and the minimum required safety factor is 1.3.

- Most of Primary No.3 Mine Access Road will be constructed on an existing dirt road. By upgrading the existing dirt road, the applicant will be minimizing erosion. Since the roads must be constructed in a narrow canyon, the applicant has limited options about where to place the road. The Division reviewed the road designs and concluded that the erosion will be minimized and that the roads are located on the most stable available surface.

- The applicant does not propose to construct fords in any perennial or intermittent streams.

Primary road certification

All primary road designs have been properly certified.

Other Transportation Facilities

The conveyor system goes from the coal bin near the portals to the tipple facilities then to the coal storage pad. The conveyor system will be enclosed to minimize fugitive coal dust emissions. The R645 rules have few design specifications for conveyor systems. The Division reviewed the conveyor plans and found that they meet the minimum engineering requirements. See Appendix 7K Page13 for information on dust control.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

SPOIL AND WASTE MATERIALS

Regulatory Reference: 30 CFR Sec. 701.5, 784.19, 784.25, 817.71, 817.72, 817.73, 817.74, 817.81, 817.83, 817.84, 817.87, 817.89; R645-100-200, -301-210, -301-211, -301-212, -301-412, -301-512, -301-513, -301-514, -301-521, -301-526, -301-528, -301-535, -301-536, -301-542, -301-553, -301-745, -301-746, -301-747.

Analysis:

Disposal of noncoal waste

Noncoal waste will be placed in metal dumpsters that are on the property. A local trash collector will remove and replace the bins when they are near capacity. This is standard procedure for most coal mines.

Coal mine waste

Coal mine waste will be temporarily stored at the designated storage site shown on Plate 2-4C. The material will not be stored at that site for more than 15 days. A maximum volume of 150 CY will be stored on site. The applicant will record when the material is place and removed from the storage site. Permanent storage of the coal waste material will be either underground or at the Hiawatha mine. Coal mine waste sent to Hiawatha will be placed in slurry pond 5A. The Hiawatha plan has been amended to allow for this activity.

In the event the coal mine waste should catch fire, the applicant will extinguish the material by spreading it out on the surface and allowing the material to burn out and/or distinguishing the fire with water

Refuse piles

The applicant does not propose to construct a refuse pile. All refuse (coal mine waste) will be disposed of underground or at the Hiawatha Mine.

The Division has approved the disposal of coal mine waste at Hiawatha's Pond No. 5A.

Impounding structures

The applicant does not propose constructing any impoundments out of coal mine waste.

Burning and burned waste utilization

The applicant did not address burning and burned waste utilization. See R645-301-528.323

Return of coal processing waste to abandoned underground workings

The applicant has approval for disposing of coal mine waste underground. The plan is mainly for small amounts of roof material.

Excess spoil

The applicant does not plan on generating any excess spoil.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

Ground-water monitoring

The plan references a recommended water monitoring plan, included in Appendix 7-J, section 10.0. The proposed monitoring plan is contained in section 7.1.7.

One flow measurement was obtained at springs WHR-7 and WHR-8. No information was provided for WHR-9. The plan indicates that these springs will not be monitored because WHR-4 is representative of these springs. Site WHR-7 was estimated to be approximately 400 ft above the Tank Seam while WHR-9 and WHR-8 are close to drill logs showing no coal.

The PHC, Appendix 7-J, includes a discussion in the subsidence section on multiple coal seam removal. Mining the Tank (upper) and Blind Canyon (lower) seams in other sections of permit area has seen cracking extend upward no more than 250 feet above the Blind Canyon Seam. The surface fractures extend down about 100 feet. Average overburden for the Tank Seam is 950 feet while for the Blind Canyon Seam, it's 1200 feet. Total subsidence for the two seams has been calculated to be 7.3 feet. Reference Table 3C-1. However, springs having significant discharge within the Wild Horse Ridge area are separated from the Tank Seam by 1000 feet. Thus, the PHC states, the potential for mining to impact these springs appears to be minimal. Given the surface fracturing, the possibility exists that surface recharge to the springs could be affected, one way or the other.

The PHC indicates it is unknown whether water may be encountered along the Bear Canyon Fault from the east, but that this water is suspected to have antiquity. The well closest the fault, MW-117, will be monitored in conjunction with MW-114, as these wells would most likely show effects if waters with antiquity do discharge to the fault should it be encountered during mining.

On March 22, 2000, an order from Division Director Lowell Braxton required the applicant to modify the permit application by including "portions of the February 21, 2000 letter 'Responses to concerns of Castle Valley Special Services District' from Mayo and Associates, LC to Charles Reynolds, Co-Op." That requirement was complied with by inclusion of the letter in Appendix 7-J. A second requirement of that Division Order was to include " a minimum of one in-mine drill hole. . . in the northern portion of the Wild Horse Ridge Addition . . " That requirement was complied with by addition of monitoring well DH-5 shown on Plate 3-4C. The well is located at the northern boundary of the mine addition. The drill hole "will be tested using the same methodology which was used in the previous in-mine wells, described in Appendix 7-N."

Surface-water monitoring

The Upper Right Fork Bear Creek, BC-4, above the proposed disturbed area, has been added to the monitoring plan. Surface water monitoring at the Left Fork of Fish Creek, FC-1 and McCadden Hollow, MH-1, were added to the monitoring plan.

Acid and toxic-forming materials

Information is contained in Appendix 6-C of the MRP. According to the PHC, strata in the proposed permit area is expected to be identical to the existing permit area. Acid from pyrite oxidation is readily consumed by dissolution of carbonate minerals available in the mine area.

Transfer of wells

No discussion on transfer of wells in the new permit area is provided. It is assumed all wells will be properly abandoned when no longer needed for mining.

Discharges into an underground mine

It was estimated that 0.05 cfs water will be required for mining associated with the Wild Horse Ridge. A water line from #1 mine to the #3 and #4 mines is located along the conveyor. This water is to be used for a bathhouse, drinking water, and for spray on the working face, at coal belt heads, at transfer points, and at the tipple for dust suppression. Page 7-56 indicates, "No water will be discharged into the mine during or following reclamation."

Gravity discharges

No gravity discharges are expected for the Wild Horse Ridge mines, Bear Canyon No. 3 or No. 4 (reference page 7-56).

Water quality standards and effluent limitations

Water quality standards and effluent limitations must be conducted according to State Standards and the approved UPDES permit. A copy of the current permit, which includes a discharge point for Pond D is included in Appendix 7-B.

Diversions

Diversion designs are provided for the 10 year- 6 hour event. The applicant committed to maintain the minimum required cross sectional area. Freeboard was presented to be 0.30 to 0.48 feet. Standard engineering practices generally use a minimum of 0.3 feet, so this is acceptable. Along the roads, additional culverted cross drains may be advantageous in meeting the ditch requirements without requiring changes in the road surface slope.

The culvert containing Bear Creek for the road to get to the new addition has been designed to meet the 100-year 6-hour storm. This is described in Appendix 7-G. This is the appropriate design storm.

Road Drainage

The applicant should consider placing a culvert at the approximate location of label D-21U on Plate 7-1 F. The primary road retains this drainage along the in slope for a significant distance in this region. Also, the slope breaks from a steep section to a low gradient area at this location which may result in maintenance problems due to sediment settling out in the ditch.

Stream buffer zones

Construction in the buffer zone will be necessary to build the roads and portal in the east fork of Bear Creek. Map 2-4 shows buffer zone markers all along the access road, along the conveyor belt roads, and along the lower edges of the topsoil storage piles. The diversion channels and culverts have been properly designed according to the appropriate sections of the regulations. Several safeguards have been included to prevent adverse impacts to the stream. These include sediment control with silt fences, berms around the topsoil storage piles, enclosure of the conveyor system, sediment traps to catch coal fines, alternate sediment control areas, a berm around the fuel tank, and sediment pond D at the portal. These measures are expected to prevent violation of water quality standards and prevent mining operations from adversely affecting the stream.

An approved stream alteration permit obtained from the State Division of Water Rights for the proposed several stream channel alterations is provided in Appendix 7-O.

Sediment control measures

Construction - Sediment Control Methods

A berm will be created on the downslope side of a cut. Road cuts will be made into the slope rather than parallel to the slope. Blasts will be designed to drop material into the cut area behind the berm, pg. 30-3. The blasting methods used here will be the same as have proven successful in constructing the other roads in the permit area. Along the Blind Canyon Seam portal pad, temporary and permanent silt fences will be placed to treat all runoff from the disturbed area not contained by a berm. Fences will remain in place until all runoff is directed to the sedimentation pond and erosion control matting will be used on the outslope of the Blind Canyon Seam portal pad fill, pg. 30-5. The applicant has committed to install the erosion control matting in strict conformance with the manufacturers instructions.

Discussions related to culvert placement and pad and operational construction in the drainages are detailed. The application states that, "Following initial pad contouring the sediment pond will be constructed followed by road crowning and ditch and culvert placement." pg. 30-6. More construction detail is contained on pages 30-2 through 5. Culverts will first be placed in the ephemeral drainages at each crossing to separate disturbed and undisturbed drainages in the event of storms during construction. Also, that way the catch basins will not receive runoff from undisturbed drainages. Special care is to be taken at a "small riparian area . . adjacent to this road". This is above the spring designated SBC-14, (WHR-6) which is a unique area. It contains a small population of the Forest Service Region 4 sensitive species Link Trail columbine. A site visit by the Division evaluation team followed by discussions with the applicant resulted in a commitment (pg.30-5) that the Division hydrologist will be notified in time to make a field visit when the blasting is to occur above this spring, SBC-14, (WHR-6) and when construction for the culvert above this spring is to take place.

Operational - Sediment Control Methods

Sediment control measures include using a sedimentation pond and BTCA erosion control areas "V" and "W". The BTCA area "V" includes the out slope along the conveyor access road and the Blind Canyon portal pad out slope area. These areas are mapped on Plate 7-1G. Erosion control matting will be used on the out slope and a berm will be placed on the outside edge to prevent water from flowing onto the slopes.

BTCA areas "W" include the conveyor belt areas. A silt fence will be placed down slope during construction, and it will be evaluated for removal following construction. During operations, coal fines will be captured in a metal pan below the belt and will be cleaned off the

pan. A dust cover will be placed over the belt to prevent fine coal wind transport. Details of the conveyor belt are presented in Figure 7K-1, Typical Conveyor Pan Structure. These appear to be reasonable measures to minimize the amount of coal fines leaving the conveyor belt.

In the lowest belt area, the pan will be cleaned with water draining to disturbed area ditch D-3D, which reports to the lower area sediment pond. The two upper conveyor belt areas will report to two catch basins, No. 1 and 2. The Wild Horse Ridge Coal Storage Bin area also reports to catch basin No. 2. These catch basins were included at the request of the Division to provide additional control of possible coal fines coming from the conveyor system. These areas are mapped on Plates 7-1C, 7-1F and 7-1G. The designs, calculations and certification for these basins are provided in Appendix 7-K. Capacity was based on a 10-year, 6-hour storm peak. Catch basins will be inspected and cleaned as necessary to maintain capacity. Both of the catch basins have an outlet spillway, so flow from the basin is controlled under situations that exceed the storage volume. These are detailed in Figures 7K -3 and -4. The spillways are provided with riprap linings.

Siltation structures.

See: Sedimentation Ponds.

Sedimentation ponds.

The proposed Wild Horse Ridge area includes designs for sedimentation pond 'D'. All runoff from the portal pad area will report to this pond. The pond was designed to the appropriate 10-year, 24-hour storm event using runoff curves of 90, which is appropriate for the pad area and the rocky drainage area leading to the pond. The pond is designed to store the full volume of the design storm. Reference Table 7.2-15, and Plate 7-11.

The sedimentation pond must maintain adequate sediment storage capacity. The proposed cleanout level of 60% meets this requirement. Reference Section 7.2.8.4 and Plate 7-11, Sediment Pond "D". At pond 'D', the decant structure is located above the 60% cleanout level. The cleanout elevation is 0.55 ft below the decant elevation. A Decant Structure Detail is included with the oil skimmer end in the pond and a control valve for sampling and draining at the downstream end.

A single open channel spillway is proposed for discharge from the pond. The spillway is appropriately designed using a 25-year, 6-hour design event and the spillway is lined with riprap. The D-50 rock size is six inches and appears appropriately designed. A fuel tank is located about 100 feet away from this pond. Plate 2-4 shows a containment berm should the tank leak. This berm and its design are to be part of the SPCC plan, which will be completed within six months after construction is completed. Full containment berms around fuel tanks are standard on the rest of the site, and will be included for this one.

Based on the letter accompanying the latest submittal, it's expected that the SPCC plan will be updated and available at the site "within six months of implementation of the Wild Horse Ridge construction." A determination will then be made whether the proposed plan minimizes potential for hydrocarbons to be released off the permit area. This needs to be included in the plan when it's finished.

Dames and Moore conducted a stability analysis for the portal staging area sedimentation pond. This analysis for steady state seepage assumes a 7-foot-deep pond is full and two seepage conditions exist: 1) A straight line condition through the fill, and 2) Seepage controlled by the native sandstone and colluvium interface. Results suggest during a pseudo-static loading condition, shallow surface slide and sloughing from the structural fill and native slopes could be expected with strong ground movement. Proposed embankments have a minimum safety factor of 1.46.

Other treatment facilities

No "other treatment facilities" are proposed.

Exemptions for siltation structures

No exemption from siltation structures are proposed.

Discharge structures

Discharge structures are designed to minimize erosion.

Impoundments

The only new impoundment associated with the Wild Horse Ridge addition is Pond D. Since the pond will be removed during reclamation, the pond is considered temporary. Therefore the requirements that apply specifically to permanent ponds do not apply.

The size and height of the impoundment may require the pond to meet additional design requirements. Such ponds are unofficially called MSHA ponds.

The following requirements apply to both temporary and permanent impoundments:

- MSHA requires that all impoundments meet additional standards if the pond 1) impounds water to an elevation of 5 feet or more above the upstream toe of the structure and can have a storage volume of 20acre-feet or more; or (2) impound water to an elevation of 20 feet or more above the upstream toe of the structure; or (3) as determined by the district manager. Pond D has a maximum storage capacity of 4,113 cubic feet (0.094 acre-feet), storage capacity above the decant.

The height of the pond from the bottom of the pond to the top of the embankment is 7.5 feet. The pond does not qualify as an MSHA pond.

- Plate 7-11 shows the plans and cross sections for Pond D. The plans have been certified by Charles Reynolds, a registered professional engineer.

- Dames and Moore conducted a stability analysis for the Portal Staging Area sedimentation pond. This analysis for steady state seepage assumes a 7-foot-deep pond is full and two seepage conditions exist: (1) A straight line condition through the fill, and (2) Seepage controlled by the native sandstone and colluvium interface. Results suggest during a pseudo-static loading condition, shallow surface slide and sloughing from the structural fill and native slopes could be expected with strong ground movement. Proposed embankments have a minimum safety factor of 1.46. The pond is required to have a minimum static safety factor of 1.3.

- The Division will monitor the construction of the Pond D to ensure that foundations are properly constructed and record made.

- The Division and the applicant used STABLE, a slope stability program, to determine that the pond would be stable under rapid drawdown conditions.

- No highwalls are associated with Pond D.

- The Division will review the inspection reports for Pond D during some monthly inspection, all complete inspection, and the review of annual reports.

Casing and sealing of wells

No changes to the plan for casing and sealing of wells is proposed. The existing plan is assumed to be adequate to handle this regulatory requirement.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

SUPPORT FACILITIES AND UTILITY INSTALLATIONS

Regulatory Reference: 30 CFR Sec. 784.30, 817.180, 817.181; R645-301-526.

Analysis:

The applicant lists the existing and proposed structures at the Bear Canyon Mine in Appendix 3A, Table 3A-1. The new facilities include (1) Wild Horse Ridge conveyor belts, (2) Wild Horse Ridge substation, (3) Wild Horse Ridge shop, and (4) Wild Horse Ridge water and fuel tanks. The new facilities are shown on Plate 2-4.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

SIGNS AND MARKERS

Regulatory Reference: 30 CFR Sec. 817.11; R645-301-521.

Analysis:

R645-301-521.200 requires the applicant to post (1) mine and permit identification signs, (2) perimeter markers signs and (3) topsoil marker signs. The applicant committed to place those signs as required. The Division's inspectors routinely check the site for signs and markers. Should a problem occur the Division will deal with it during a routine inspection.

Findings:

Information provided in the amendment is adequate to meet the regulatory requirements for this section.

USE OF EXPLOSIVES

Regulatory Reference: 30 CFR Sec. 817.61, 817.62, 817.64, 817.66, 817.67, 817.68; R645-301-524.

Analysis:

A blast design is submitted as Appendix 3-M which describes a blasting plan for the construction of the conveyor access roads associated with the Wild Horse Ridge addition which will comprise the Bear Canyon #3 and #4 Mines. The anticipated blasting plan has been

prepared and signed by Mr. Kevin Petersen who is known to have a current surface blasting certificate issued through the State of Utah.

The plan clearly indicates that there are no active or abandoned underground coal mines, dwellings or public buildings within the radial distances described within R645-301-524.211 and -524.212. The response clearly states that there are no active or abandoned underground coal mines within 500 feet of the proposed Wild Horse Ridge blasting area. No other buildings exist within 1,000 feet of the proposed Wild Horse Ridge blasting areas. Although a hunting cabin exists approximately 750 feet from the nearest proposed blasting area, the building cannot be classified as a dwelling or as a public building, (school, church, etc.). Although the applicant's response does contain an anticipated blast design, it was not necessary to submit it. Regulations R645-301-524.210 through -524.212 have been adequately addressed. The anticipated blast design which has been submitted appears to be able to successfully meet the fragmentation requirements being sought without incurring significant damage to the surrounding environment.

The applicant's response provides the following information to address deficiencies aired in the initial response:

1) A drawing that shows the burden, spacing and depth of boreholes for the bench type blasting to be used for bedrock removal (establishment of road grade) has been provided. A verbal description of the method to be used for boulder breakage has also been provided.

2) Page 3M-3 of the revised blasting plan clearly states that satchel type directional charges will not be used in order to minimize air blast and fly-rock. A description of the explosive to be used (Irecoal D 378), is not a satchel type directional charge.

3) Borehole will have the proper diameter for safe blasting.

4) The revised blast design has more than doubled the weight of explosive which will be used per borehole. They will be using 1.3 pounds per hole, with a maximum of ten holes per round; hence a maximum of 13 pounds of explosive will be used per round. This improves the powder factor significantly in the anticipated blast design. The ability to adjust fragmentation within the round is within the jurisdiction of the certified blaster performing the work, and it is not necessary to obtain DOGM approval for minor changes in powder factor.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Analysis:

Affected area maps

Several maps show the permit boundaries and proposed mining areas. Those maps are considered adequate to serve as the affected area map.

Mining facilities maps

Plate 2-4G and other maps show the mining facilities.

Mine workings maps

The mine maps for the two seams in the Wild Horse Ridge project are Plate 3-4A Bear Canyon seam (lower) and Plate 3-4C Tank seam (upper).

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

RECLAMATION PLAN

GENERAL REQUIREMENTS

Regulatory Reference: PL 95-87 Sec. 515 and 516; 30 CFR Sec. 784.13, 784.14, 784.15, 784.16, 784.17, 784.18, 784.19, 784.20, 784.21, 784.22, 784.23, 784.24, 784.25, 784.26; R645-301-231, -301-233, -301-322, -301-323, -301-331, -301-333, -301-341, -301-342, -301-411, -301-412, -301-422, -301-512, -301-513, -301-521, -301-522, -301-525, -301-526, -301-527, -301-528, -301-529, -301-531, -301-533, -301-534, -301-536, -301-537, -301-542, -301-623, -301-624, -301-625, -301-626, -301-631, -301-632, -301-731, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-732, -301-733, -301-746, -301-764, -301-830.

Analysis:

Terracing as a reclamation method is described on page 3-75. The areas proposed to be terraced are shown on the reclamation map. Although terracing may be appropriate in some locations it is found to be less effective than simple slope changes in many locations in Utah. Slope form or slope breaks that decrease the gradient and retain the overland flow are best technology available for erosion control. In steep sections, slope faces steepened at the top and concave toward the base integrated with low angle slopes are known to be successful.

The plan says, "Since a cut slope existed along portions of this area prior to mining there may not be enough material to completely eliminate the entire cut. In areas where cuts existed prior to mining, the (fill) material will be placed so as to backfill the cut to the extent possible. These areas are shown on Plates 3-2," (pg. 3-119). These areas are on the upper side of the roads that were constructed before mining and these same roads will be left after mining. Typically the cuts are 15 to 20 feet high with the maximum at one location of 30 feet. Such cut slopes are typical of early roads constructed in the area. Since the area is exposed bedrock, no impact has been noted nor is any anticipated.

Portals will be sealed with backfill beginning at the Blind Canyon portal and backfilling the cut slope as it is excavated from down slope side. A narrow access road will be retained for topsoil access. Topsoil will be placed on excavated areas and then the access road will be reclaimed (3-117 to 3-118). The amendment clarifies the reclamation for the Wild Horse Ridge Blind Canyon portal is separate from the portal west of Bear Creek.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

POSTMINING LAND USES

Regulatory Reference: 30 CFR Sec. 784.15, 784.200, 785.16, 817.133; R645-301-412, -301-413, -301-414, -302-270, -302-271, -302-272, -302-273, -302-274, -302-275.

Analysis:

The applicant has proposed no changes to the postmining land use, and information in the current mining and reclamation plan is considered adequate.

Findings:

Information in the application is adequate to meet the requirements of this section of the regulations.

PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES

Regulatory Reference: 30 CFR Sec. 817.97; R645-301-333, -301-342, -301-358.

Analysis:

The reclamation plan is designed to restore wildlife habitat. Species to be planted for revegetation should provide good forage and cover. Other habitat requirements, such as water and nesting areas, are not generally limiting, so providing artificial water sources or artificial nest sites is not necessary.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

APPROXIMATE ORIGINAL CONTOUR RESTORATION

Regulatory Reference: 30 CFR Sec. 784.15, 785.16, 817.102, 817.107, 817.133; R645-301-234, -301-270, -301-271, -301-412, -301-413, -301-512, -301-531, -301-533, -301-553, -301-536, -301-542, -301-731, -301-732, -301-733, -301-764.

Analysis:

The requirements for restoring a site to the approximate original contour (AOC) are

couched in the backfilling and grading regulations. The only regulation that specially mentions AOC requirements is R645-301-553.110 that says:

> Achieve the approximate original contour (AOC), except as provided in R645-301-553.500 through R645-301-553.540 (previously mined areas (PMA's), continuously mined areas (CMA's) and areas subject to the AOC provisions), R645-301-553.600 through R645-301-553.612 (PMA's and CMA's), R645-302-270 (non-mountaintop removal on steep slopes), R645-302-220 (mountaintop removal mining), R645-301-553.700 (thin overburden) and R645-301-553.800 (thick overburden);

Since the Wild Horse Ridge site is a post-SMCRA underground site the applicant must show that the AOC requirements can be met. Even if an AOC variance is granted, the applicant must show that the site can be restored to AOC standards.

The Division's technical directive Tech-002 gives additional AOC guidelines. That guideline was also used to evaluate the Wild Horse Ridge site for AOC compliance.

Except as specifically exempted, all disturbed areas shall be returned to the approximate original contour. The final surface configuration shall closely resemble the general surface configuration of the land prior to mining. To evaluate compliance with this requirement, the term "surface configuration" must be clarified. Surface configuration refers to the premining and postmining topography of the mine site and surrounding area.

The term AOC does not mean that the land is restored to the original contours. Elevation of the premining and postmining site should only play a minor role if any in evaluating AOC.

The main criterion should be whether the postmining topography, excluding elevation, closely resemble the premining configuration. The Division evaluates premining and postmining topography on slope length and angle, and whether restoring the site to the original contours would violate other rules.

In some cases the applicant cannot restore the site to the premining contours without violating other regulations, such as slope stability and erosion. Many of the natural slopes in the area are at the angle-of-repose. By definition when a slope is at its angle-of-repose the safety factor is 1.0. The minimum safety factor for reclaimed slopes is 1.3. If all slopes were returned to the premining conditions, the safety factor requirement could not be met.

When the natural slope has a safety factor less than 1.3, the applicant usual opts to reduce the slope angle by either extending the toe or decreasing the height. Extending the slope's toe may block the drainage which violates other regulations. If the applicant decreases the slope height then a cut slope will be left.

The premining and postmining cross sections for the Wild Horse Ridge project are in Appendix 3 O and are divided into the (1) Lower Conveyor Access Road; (2) Upper Conveyor Access Road; and (3) Mine Portal Area. The applicant proposes to restore most of the site to the premining contours. However, some cut slopes will be left.

Post-SMCRA cut slopes do not have to be fully reclaimed, because they are not highwalls (portal face up areas). The Division does not have standards or regulations that deal with retention of cut slopes. The Division does allow cut slopes to be left after reclamation if they are stable and do not substantially increase the potential for safety or environmental problems.

The applicant will backfill the site to the premining elevations whenever possible. In most cases the cut slopes will be in solid rock. The Division's staff reviewed the cross section in Appendix 3 O and found that the reclaimed slopes resemble the slopes in the surrounding area.

Under AOC guidelines all spoil piles must be eliminated. The applicant claims that no spoil (excess material) will be generated from the Wild Horse Ridge project.

The applicant committed to reclaim all highwalls. The premining and postmining contour maps suggest that all highwalls will be eliminated. The cross sections in Appendix 3O show that all highwalls will be eliminated during final reclamation

The AOC guidelines require that the restored drainages complement the surrounding natural drainages. The Division considers this requirement to be met if all the hydrologic regulations have been satisfied.

The AOC guidelines require that the reclaimed topography be compatible with the postmining land use, alternative postmining land use, or that a variance from the AOC requirements be granted. The applicant did not ask for an AOC variance. The Division considers those to be met if all postmining regulations have been satisfied.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

BACKFILLING AND GRADING

Regulatory Reference: 30 CFR Sec. 785.15, 817.102, 817.107; R645-301-234, -301-537, -301-552, -301-553, -302-230, -302-231, -302-232, -302-233.

Analysis:

The general backfilling and grading requirements are (1) achieve the approximate original contour; (2) eliminate all highwalls, spoil piles and depressions; (3) achieve a postmining slope that does not exceed the angle of repose or such lesser slopes as is necessary to achieve a minimum long term static safety factor of 1.3 and to prevent slides; (4) minimize erosion and water pollution both on and off site; and (5) support the approved postmining land use. The AOC , highwall elimination, erosion and water pollution, and postmining land use requirements have all been discussed in the AOC section of this technical analysis, refer to that section for more details.

The applicant does not plan to produce any spoil material at the Bear Canyon Mine including the Wild Horse Ridge project. The postmining contour maps show that no depression will be left after final reclamation.

A Dames and Moore study investigated the slope stability for the reclaimed slopes. The information in the reports shows that all reclaimed slopes will meet or exceed the minimum safety factor requirements. The Division reviewed the report and found that it met the minimum requirements for slope stability studies.

The backfilling and grading requirements have some specific requirements. The only such requirement relative to the Wild Horse Ridge project is that all coal seams be backfilled adequately covered. All coal seams at the Wild Horse Ridge site will be covered and backfilled.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

MINE OPENINGS

Regulatory Reference: 30 CFR Sec. 817.13, 817.14, 817.15; R645-301-513, -301-529, -301-551, -301-631, -301-748, -301-765, -301-748.

Analysis:

The mine opening closure plan is given in Section 3.6.3.1 of the approved mining and reclamation plan. The plan is adequate for the mine openings at the Wild Horse Ridge.

Findings:

The amendment meets the minimum requirements of this section.

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

Analysis:

Chapter 8, Soil Resources, Section 8.10, Redistribution of Soils, and Section 8.11, Nutrients and Soil Amendments, discuss the soil reclamation plan for the proposed Wild Horse Ridge area. The information is reviewed in this order:

- Soil Redistribution
- Soil Nutrients and Amendments
- Soil Stabilization

Soil Redistribution

Based on the 3.6 re-contoured acres (Table 8.3-2) and the 8700 CY of soil salvage (Table 3O-1), the average topsoil replacement thickness for the Wild Horse Ridge disturbed area should be 18 inches.

The mining and reclamation plan divides the mining area up into different reclamation areas. The Wild Horse Ridge area is divided up into areas TS-12, TS-13, TS-14, and TS-15 as follows:

TS-12, Wild Horse Ridge Access Road

The Wild Horse Ridge Access Road already exists and provides access to a hunting lodge located further up the hillside. After mining, this road will remain and continue providing access

to the hunting lodge. During upgrading and widening of the road during mining, topsoil will be recovered (15 inch depth) from isolated areas of new additional disturbance (0.22 acres). During reclamation, salvaged soils will be redistributed to the same additional disturbed areas (0.22 acres) of the road at the same depth (15 inches).

TS-13, Conveyor Belt Access Road/ Topsoil Stockpile Area

The plan states that following re-contouring of this area at the time of final reclamation, topsoil recovered prior to construction will be redistributed to obtain an approximate depth of 13 to 14 inches. Soil salvage ranges from 12 inches on the slopes in the upper portions of the road to 40 inches from lower portions of the road. The plan states that 2,054 cubic yards of topsoil from this area may be utilized in other areas of the mine site.

TS-14, Upper Conveyor belt/Access Road

The upper conveyor belt/access road will have 10 to 30 inches of topsoil recovered. Topsoil redistribution will be performed in conjunction with regrading due to the remoteness of the site and the reclamation procedures of this area. The plan states that topsoil recovered from this area will be redistributed at an average depth of 13 to 14 inches.

TS-15, WHR Blind Canyon Seam Portal

This area will have 10 to 30 inches of topsoil salvaged for reclamation. Topsoil redistribution will be performed in conjunction with regrading due to the remoteness of the site and the reclamation procedures of this area. The plan states that topsoil recovered from this area will be redistributed at an average depth of 13 to 14 inches.

Soil Nutrients and Amendments

Section 8.11, Nutrients and Amendments, states that following final grading, each of the reclamation areas will be sampled (see Table 8.11-1 for Sample Density) and the collected soil samples analyzed. The plan states that additional samples will be taken in the event that the initial sample indicates unsuitable material. Composite samples will be taken from 0 to 2 feet and from 2 to 4 feet at each sample location. The section concludes that all necessary fertilization and chemical treatments will be applied according to the results of the soil sampling and analysis program approved by the Division. In addition to analyzing the samples for micro nutrients, analyses will also include standard fertility tests for pH, EC, nitrogen, phosphorus, and potassium. All sampling, testing and result interpretation will be done by a qualified soil scientist. The soil scientist will be qualified to sample, test and interpret data results. Prior to sampling and testing of the topsoil material, the Division will review the soil scientist's qualifications.

Soil Stabilization

Following backfilling and regrading, the regraded surface will be scarified by a ripper to a depth of 14 inches to help reduce surface compaction, provide a roughened surface to help topsoil adherence, and help promote root penetration. Steep slope areas will be roughened by ripping to create ledges, crevices, pockets, and screes (talus slopes at the base of cliffs) to allow better soil retention and vegetation establishment.

To minimize compaction of replaced topsoil, travel on reclaimed areas will not be allowed. Co-Op will guard against erosion by using mulch, tackifier, and erosion control matting. Topsoil will be redistributed in the fall of the year to help promote vegetation establishment. In all cases, a very rough seedbed will be prepared.

Findings:

Information provided in the application is considered adequate to meet the requirements of this section of the regulations.

ROAD SYSTEMS AND OTHER TRANSPORTATION FACILITIES

Regulatory Reference: 30 CFR Sec. 701.5, 784.24, 817.150, 817.151; R645-100-200, -301-513, -301-521, -301-527, -301-534, -301-537, -301-732.

Analysis:

Reclamation

In Section 3.6.12 of the Wild Horse Ridge amendment, the applicant states that the portal pad access road will be backfilled. As fill material is placed on the access road, it will result in narrowing the road width, while backfilling the cut slope. Large diameter rocks will be incorporated into the outslope created by filling to aid in surface stability. This procedure will be followed until most of the cuts are backfilled and the road has been narrowed to a "pilot cut" which will still allow the equipment access to the area. The pilot cut will then be reclaimed in the same manner as the Tank Seam Access Road described in Section 3.6.11.

In Section 3.6.3.3 the application says:

> The mine access road below the No. 3 Mine Access Road will be regraded and fitted with post-mining diversion structures as shown on Plate 3-2. Diversion designs are shown in Appendix 7-H. Asphalt road surfacing material from the scalehouse pad will be excavated and disposed of at the Nielson Construction Landfill in Emery County. All

roads that are to be reclaimed will be closed to traffic during reclamation. The reclaimed road design will be the same as the operational design, and is shown on Plate 3-5.

As backfilling and grading is completed, operational areas will be scarified by gouging to a depth of approximately 8 inches with a trackhoe. This will reduce compaction and prevent topsoil slippage, and improve soil retention and vegetation establishment in the gouges.

The road reclamation plan adequately addresses the requirements to close the roads to the public during reclamation, describes how the culverts will be reclaimed and disposal of road surface materials.

The applicant did not address road closure during reclamation, or how the roads that provide access to the conveyors would be reclaimed, or the condition that the main access road will be left in and how the road surface material will be disposed and how the road will be scarified.

Retention

The applicant states that those sections of the road that will be retained as part of the post mining land use will have the same design as the roads during operations.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.

Analysis:

Ground-water monitoring

The operational ground-water monitoring plan will continue through reclamation to bond release.

Surface-water monitoring

The operational surface-water monitoring plan will continue through reclamation to bond release.

Acid and toxic-forming materials

The operational surface-water monitoring plan will continue through reclamation to bond release.

Transfer of wells

No discussion on transfer of wells in the new permit area is provided. It is assumed all wells will be properly abandoned when no longer needed for mining.

Discharges into an underground mine

No discharges into an underground mine are proposed for reclamation purposes.

Gravity discharges

No discussion indicating gravity discharges is expected in relation to the Wild Horse Ridge reclamation.

Water quality standards and effluent limitations

No specific information is presented indicating how water quality standards and effluent limitations will be determined prior to bond release.

Diversions

Roads to be retained in place will be re-graded to the proposed post-mining configuration and fitted with diversions. A typical cross section is in 3.6.4, pg. 3-60. To maintain the road for post-mining land use, 11 culverts will be retained. The Wild Horse Ridge Access Road is proposed for retention for post-mining land use. Conveyor Access roads No.1 (lower road) and No.2 (upper road) are described in App.3-O and will be reclaimed the same as described in section 3.6.11 and 3.6.12 (3D-7A). Stream channel reclamation uses a riprapped channel design as presented in Appendix 7H. These appear to meet regulatory requirements.

Stream buffer zones

Construction in the buffer zone will be necessary during reclamation. The sequence of construction is designed for minimum sediment generation. Silt fences are used to control sediment.

Sediment control measures

All re-graded and top soiled areas will be mulched or otherwise treated to retain moisture and control sediment, page 4-13. Related surfaces will be ripped and scarified using a trackhoe which includes roughening to 8-12 inch deep pockets. See the section of this analysis discussing sedimentation ponds.

Siltation structures

See sedimentation ponds.

Sedimentation ponds

Sediment pond 'D' is proposed to be removed during reclamation of the portal pad as described in Appendix 7-K, and Section 3.6.12, Wild Horse Reclamation Plan. The reclamation construction sequence describes the methods used during pad area reclamation to minimize sediment contributions to the drainage. These include installation of silt fences on the downstream sides of all construction areas, especially the portal pad area. After highwall removal, the road cut slope will be eliminated. A "pilot cut" will be retained to allow topsoil placement in the area. The pilot cut will then be reclaimed.

Other treatment facilities

No other treatment facilities are proposed in conjunction with the Wild Horse Ridge amendment.

Exemptions for siltation structures

No exemptions for siltation structures are requested in association with the Wild Horse Ridge amendment.

Discharge structures

No discharge structures are proposed for retention in association with the Wild Horse Ridge amendment.

Impoundments

See sedimentation ponds.

Casing and sealing of wells

No changes are made to the existing plan in conjunction with casing and sealing of wells. It is assumed the existing plan is adequately addresses this requirement.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

CONTEMPORANEOUS RECLAMATION

Regulatory Reference: 30 CFR Sec. 785.18, 817.100; R645-301-352, -301-553, -302-280, -302-281, -302-282, -302-283, -302-284.

Analysis:

Contemporaneous reclamation is required as a performance standard. Since this is an underground operation, a schedule for contemporaneous reclamation is not required.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

REVEGETATION

Regulatory Reference: 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.

Analysis:

Timing

Table 9.5-1 of the current mining and reclamation plan is a revegetation schedule. According to this schedule, seeding would be done in October and November with seedlings planted in March and April of the subsequent year. While this schedule is adequate, other operators in the area have had good success planting containerized seedlings in the fall. Bareroot plants or cuttings should be planted in the spring.

Mulching and other soil stabilizing practices.

Chapters 3 and 8 discuss surface preparation. As backfilling and grading are completed, operational areas will be scarified by gouging about eight inches deep with a trackhoe. All areas will be gouged to increase surface roughness.

Following surface preparation, the site would be hydroseeded or otherwise broadcast seeded. All hydroseeded or hand seeded areas will be raked lightly to ensure adequate seed-soil contact. On slopes steeper than 2h:1v, one-half of the seed will be applied, the area will be raked, then the rest of the seed will be applied.

The applicant has added canyon sweetvetch to the seed mix. This species will be planted on the topsoil pile. The applicant will obtain seed for final reclamation by harvesting seed from the topsoil pile and from nearby undisturbed areas.

The applicant has proposed to reduce the number of rose seedlings, and this reduction is acceptable. Willows will be cut from a source area in close proximity to the mine site and planted in the reclaimed area. In areas of suitable habitat, willows will be planted with at least one cutting every foot. Other operators have needed to come back after a few years to supplement willow plantings, and it may be necessary for the applicant to do this. It is common that sediment builds up over a few years in a riprapped channel, and these areas with sediment accumulation become good places to plant willows.

The plan gives detailed descriptions of how seedlings would be handled and planted and about the quality of seed that would be used. Following these commitments should help ensure successful revegetation.

A minimum of 120 pounds per acre of wood fiber hydromulch will be used when hydroseeding. It is a standard practice to add some hydromulch when hydroseeding, but adding all the mulch when seeding reduces seed contact with the soil.

Following seeding, all areas with slopes flatter than 2h:1v will hydromulched and fertilized. Slopes steeper than 2h:1v will be mulched with erosion control matting.

Section 9.5.5.1 contains a list of noxious weeds, and this list has been updated.

The current mining and reclamation plan includes a revegetation monitoring schedule. The performance standards in R645-301-356 require that for lands with a postmining land use of wildlife habitat, at least 80% of woody plants must have been in place for at least 60% of the extended responsibility period, and no trees or shrubs in place for less than two years may be counted toward the success standard. To show this standard has been met, it would be necessary to monitor for woody plant density in the fourth and eighth years after reclamation, and the

monitoring schedule in the plan does not show monitoring would be done in these years. This is not considered a deficiency since the regulations do not require a monitoring schedule.

The revegetation methods in the application should provide vegetation that complies with the requirements of R645-301-342 for wildlife habitat and with the performance standards in R645-301-353 and R645-301-356. The Division considers that revegetation is feasible at this site.

Standards for success

The proposed reference area had more vegetative cover than the proposed disturbed area, but the difference was not significant. The reference area had significantly more woody plants than the proposed disturbed area, but this is not critical because the success standard is a technical standard established in consultation between the Division and Wildlife Resources (see below). While there are some differences in species composition between the reference area and proposed disturbed area, the reference area is similar enough that it is considered an acceptable standard.

The reference area had 1405 woody plants per acre, and the proposed disturbed area had 1010. Considering the plant communities and the topography, 1010 is considered an attainable and acceptable standard for success for woody plant density, and the applicant has included the standard in the application. The standard was established in consultation with the Division of Wildlife Resources.

Findings:

Information in the application is adequate to meet the requirements of this section of the regulations.

CESSATION OF OPERATIONS

Regulatory Reference: 30 CFR Sec. 817.131, 817.132; R645-301-515, -301-541.

Analysis:

The plan for cessation of the operation is part of the approved mining and reclamation plan.

Findings:

The amendment meets the minimum requirements of this section.

MAPS, PLANS, AND CROSS SECTIONS OF RECLAMATION OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-323, -301-512, -301-521, -301-542, -301-632, -301-731.

Analysis:

Affected area boundary maps

The applicant did not give the Division an affected area boundary map. The Division usually considers the permit area to be equal to the affected area. Plate 2-1 is the permit area map, and the Division found that the map accurately shows the permit boundaries.

Bonded area map

The Division usually considers the bonded area to be equal to the permit area. Plate 3-2A, Plate 3-2B and Plate 3-2F show the disturbed area boundaries during reclamation.

Reclamation backfilling and grading maps

The applicant must give the Division detailed maps that show how the backfilling and grading requirements will be met. The specific items missing from maps and cross sections are: the location of the highwalls, cut slopes and coal seams.

Reclamation facilities maps

The applicant gave the Division detailed maps of all reclaimed facilities including the access road.

Final surface configuration maps

The applicant gave the Division detailed maps and cross sections that show the final surface configuration.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

BONDING AND INSURANCE REQUIREMENTS

Regulatory Reference: 30 CFR Sec. 800; R645-301-800, et seq.

Analysis:

Determination of bond amount

Demolition:

The Division calculated the demolition and disposal costs as outlined in the OSM Reclamation Cost Handbook and according to standard Division practices. Those procedures are outlined as follows:

- The Division does not allow salvage value in the reclamation cost estimates.
- The Division will allow the cost of steel disposal to be based on the transportation cost to a scrap dealer.
- Because the disposal fees for landfills are site-specific, the Division will base those fees on local landfills provided the costs can be documented. The applicant has the obligation to provide that information. The Division assumes that all non-steel and non-concrete demolition will be shipped to the Neilson landfill.
- If the approved mining and reclamation plan states that some type of debris can be disposed of on site then the on-site disposal fees must be included. On site disposal fees, should be included to cover the cost of transporting the debris to a disposal site and backfilling and covering the debris.

The Division and the applicant reviewed and agreed upon the demolition costs. See the bond cost estimate for more details.

Earthwork:

- Tank Seam Access Road and Portal Pad: No material will be imported or exported from this site. A total of 20,310 CY will be cut and then used as fill. Approximately 9,649 CY of material will be cut and filled in one operation with an excavator. The amount of material to be hauled by truck within the site is 10,661 CY. The applicant assumed that the material to be hauled will be loaded by an excavator onto a 10 CY dump truck. Once the material has been trucked an excavator will place it.

- Upper Storage Pad: The amount of fill needed is 8,083 CY. Local cuts will produce 6,447 CY, and the remaining fill will be shipped from the coal storage pad. The cut and fill operation is assumed to be a continuous operation with an excavator. Placing the imported fill will also be done with an excavator. The transportation costs for hauling the fill from the coal storage pad will be calculated in the coal storage pad subsection.

- Portal Pad Area & Road: The amount of fill needed is 7,908 CY. Local cuts will produce 6,648 CY, and the remaining fill will be shipped from the coal storage pad. The cut and fill operation is assumed to be a continuous operation with an excavator. Placing the imported fill will also be done with an excavator. The transportation costs for hauling the fill from the coal storage pad will be calculated in the coal storage pad subsection.

- Portal Pad Area: The amount of fill needed is 7,908 CY. The fill material will come from on site and the coal storage area if needed. The cut and fill operation is assumed to be a continuous operation with an excavator. Placing the imported fill will also be done with an excavator. The transportation costs for hauling the fill from the coal storage pad will be calculated in the coal storage pad subsection.

- Portal Access Road: The amount of fill needed is 9,167 CY. The fill material will come from on site and the coal storage area if needed. The cut and fill operation is assumed to be a continuous operation with an excavator. Placing the imported fill will also be done with an excavator. The transportation costs for hauling the fill from the coal storage pad will be calculated in the coal storage pad subsection.

- Lower Road to Switchback: The amount of cut and fill material needed is 4,028 CY. The cut and fill amounts balance, so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with an excavator.

- Tipple Access Road: The amount of cut and fill material needed is 1,167 CY. The cut and fill amounts balance, so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with an excavator.

- Coal Storage Pad: The site has 19,453 CY of cut material and needs 15,333 CY of fill material. The on site cut and fill operation will be done with a bulldozer. The loading and trucking of material will be done with a front-end loader and dump trucks.

- Scale House: The amount of cut and fill material is 711 CY. The cut and fill amounts balance, so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with a bulldozer.

- Sediment Pond "A": The amount of cut and fill material is 1,556 CY. The cut and fill amounts balance, so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with a bulldozer.

- Sediment Pond "B": The amount of cut and fill material is 1,167 CY. The cut and fill amounts balance so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with a bulldozer.

- Sediment Pond "C": The amount of cut and fill material is 324 CY. The cut and fill amounts balance, so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with a bulldozer.

- Shower House: The amount of cut and fill material is 3,426 CY. The cut and fill amounts balance, so no material will be imported or exported from the site. The applicant assumes that all cut and fill operations can be done with a bulldozer.

- Wild Horse Ridge Portal Area: The amount of cut and fill material is 10,288 CY, with and additional 4,860 CY of topsoil that will be imported. The applicant assumes that all cut and fill work will be done with a bulldozer. The topsoil will be loaded with a front-end loader and haul in dump truck to the site. All topsoil will be spread with a bulldozer.

- Wild Horse Ridge Upper Access Road: The amount of cut and fill material is 1,912 CY with 2171 CY of topsoil to be imported. The applicant assumes that the material can be moved with a bulldozer. The topsoil will be loaded with a front-end loader and haul in dump truck to the site. All topsoil will be spread with an excavator.

- Wild Horse Ridge Upper Access Road: The amount of cut and fill material is 2,947 CY. The applicant assumes that half the material can be moved with a bulldozer and the other half with an excavator.

The Division and the applicant reviewed and agreed on the earthwork costs. See the bond calculations for more details.

Vegetation Costs:

The vegetation costs were based on the following:

- The approved mining and reclamation plan and the proposed addition of the Wild Horse Ridge area. In addition a Division biologist review the reclamation cost estimate.

- The revegetation rate would be 25%.

- Seeds and seedlings costs were based on costs for purchasing them from local dealer. Since these costs can fluctuate on an annual basis the Division will continually review the costs and make adjustments as needed.

Indirect Costs:

The indirect costs that the Division calculates are as follows:

- Startup Costs: The startup costs include mobilization/demobilization, permits, insurance and bonds. **The Division assumes that the startup costs for a reclamation project are 10% of the direct costs**. The 10% amount is based on a flat rate stated on Page 23 of the OSM's *Handbook for Calculation of Reclamation Bond Amount Revised April 2000.* The OSM handbook did not include a reference for the 10%. That amount is verified by AML costs.

- Contingency: The contingency amount is listed in the section entitled "How to Use the Book: The Details" in the R. S. Means Company, Inc. publications. For example see Page vii of the 14th Edition of the R. S. Means Heavy Construction Cost Data 2000. The contingency range in the year 2000 is 5% to 10%. **Therefore, the Division will use the low range of 5%.**

Note: The contingency fee is for items that will be encountered but have not yet been identified in the permit application, Mining and Reclamation Plan, proposed amendments or significant revisions.

- Engineering Redesign Fee: The engineering redesign fee is the line item identified in the R. S. Means Company, Inc. publications by the reference number 01107 3000 0800, also known as Landscape & Site Development, minimum. **The minimum engineering redesign fee for the year 2000 is 2.5%.**

- Main Office Expense: The cost for the main office expense is shown as line items in the R. S. Means Company, Inc. publications. Main office expense cover costs that are not directly incurred for a specific project but are needed by the contractor to operate. Examples of main office expense include, but are not limited to, administrative costs, building rental, equipment storage areas, and certain types of insurance and taxes. The following reference numbers are used to calculate main office expenses: 01310 400 0130, 01310 400 0150, 01310 400 0200, 01310 400 0250

and 01310 400 0300 depending on the direct costs. The indirect costs are 8% up to $1,000,000, **6.8% up to $4,000,000,** 5.6% up to $7,000,000 and 5.10% up to $10,000,000 and 3.9% for more than $10,000,000 for the year 2000.

- Project Management Fee: The project management fee is the line item identified in the R. S. Means Company, Inc. publications by reference number 01107 200 0050 and 01101 200 0050 depending on the direct costs. The costs are 4.5% for direct costs up to $1,000,000 and **2.5% for direct costs of up to $5,000,000** for the year 2000.

Inflation:

The Division uses the three-year average for the escalation factor from the Means Historical Cost Index for Utah. The Division will escalate the demolition and earthwork costs to the end of the permit term (maximum of 5 years).

Terms and conditions for liability insurance

No new insurance will be required for the addition of the Wild Horse Ridge project.

Findings:

Information provided in the application is adequate to meet the requirements of this section of the regulations.

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ENVIRONMENTAL ASSESSMENTS

DECISION NOTICE
AND
FINDING OF NO SIGNIFICANT IMPACT
FOR THE READJUSTMENT OF
FEDERAL COAL LEASE U-38727

PRICE RANGER DISTRICT
MANTI-LASAL NATIONAL FOREST
EMERY COUNTY, UTAH

On March 19, 1986, the Forest Service received notification from the Bureau of Land Management that Federal Coal Lease U-38727 would be subject to readjustment of terms and conditions on May 1, 1988. This notification required conducting an environmental analysis of the proposed action pursuant to the National Environmental Policy Act of 1969. A Forest Service Interdisciplinary (ID) Team met on September 3, 1986 to evaluate the proposal.

Leasing and development will be under the authority of the following authorizing actions: The Mineral Leasing Act of February 25, 1920, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; the Surface Mining Control and Reclamation Act (SMCRA) of 1977; the Multiple Minerals Development Act of August 4, 1977; the National Environmental Policy Act (NEPA) of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; regulations: Title 43 CFR Group 3400, Group 2800; and Title 30 CFR Group 700; and the Manti-LaSal National Forest Land and Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (FEIS), 1986.

An Environmental Assessment (EA) was prepared under the direction of the Manti-LaSal National Forest Supervisor. Based on the analysis presented in this EA, it is our decision to consent to approval of the proposed readjustment for that portion of the lease within the Forest, subject to the addition of stipulations in Appendix A of the EA. Alternative "B", as described in the EA, is a viable alternative under existing legislation and Forest Service policy, management decisions, and direction. The No Action Alternative was evaluated and determined not to be viable as it would allow continuation of the lease under terms inconsistent with the Forest Plan and FEIS.

This is not a major Federal action that would significantly affect the quality of the human environment; therefore, an Environmental Impact Statement is not needed. This determination was made considering the following factors:

1. No new surface disturbing operations or facilities are proposed at this time. If surface disturbing operations or facilities are proposed in the future, a site-specific environmental assessment will be prepared at that time. Additional stipulations may be specified as needed to protect the environment.

2. The identified impacts, including cumulative effects, can be effectively mitigated to an acceptable level.

3. No known prime or unique farmlands, wetlands, timber lands, or rangelands; floodplains; alluvial valley floors; paleontological or cultural resources; nor threatened, endangered, or sensitive floral or faunal species will be impacted by readjustment of this issue.

4. Readjustment of this lease is consistent with the directions and decisions of the Forest Plan and FEIS, dated November 5, 1986.

Based on this assessment and evaluation, Federal Coal Lease U-38727 should be readjusted by the Bureau of Land Management and shall include the stipulations listed in Appendix A of the EA. The decision is subject to administrative review (appeal) pursuant to 36 CFR 211.18, Secretary of Agriculture Appeal Regulation. A written notice of appeal must be filed with this office within 45 days of the date of this decision.

W. C. Rudeen
~~for~~ Regional Forester

8/31/87
Date

ENVIRONMENTAL ASSESSMENT FOR THE READJUSTMENT OF FEDERAL COAL LEASE U-38727

PRICE RANGER DISTRICT
MANTI-LASAL NATIONAL FOREST
EMERY COUNTY, UTAH

Responsible Official: J.S. Tixier
Regional Forester
Intermountain Region (R-4)
USDA - Forest Service
Federal Building
324 25th Street
Ogden, Utah 84401

For Further Information Contact: George Morris
Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

or: Ira W. Hatch
District Ranger
Price Ranger District
599 West Price River Drive
Price, Utah 84501

Prepared by: Walter E. Nowak, Geologist

ENVIRONMENTAL ASSESSMENT FOR THE READJUSTMENT OF FEDERAL COAL LEASE U-38727

I. INTRODUCTION

A. Purpose and Need for Action

The Bureau of Land Management (BLM) notified the Forest Service on March 19, 1986 that Federal Coal Lease U-38727, currently leased to Nevada Electric Investment Company, would be subject to readjustment of terms on May 1, 1988. As the surface managing agency for most of this lease area, the Manti-LaSal National Forest is responsible for conducting an Environmental Assessment (EA) of the proposed action pursuant to the National Environmental Policy Act (NEPA) of 1969. Also, the 1984 Interagency Agreement between the BLM and the Forest Service for Mineral Leasing provides for joint scoping and preparation of a single EA and two-part decision document, if appropriate. On May 6, 1987, the Manti-LaSal National Forest formally solicited input for the subject lease from the Moab District BLM office. It was agreed that the Forest Service would prepare the EA for National Forest System lands involved in the lease and submit the Forest Service Decision Notice to BLM documenting the Forest Service consent decision. This EA will then address the proposed readjustment and identify management requirements for resource protection only for the 660.39 acres of Federal Coal Lease U-38727 that fall within the boundaries of the Manti-LaSal National Forest.

B. Authorizing Actions

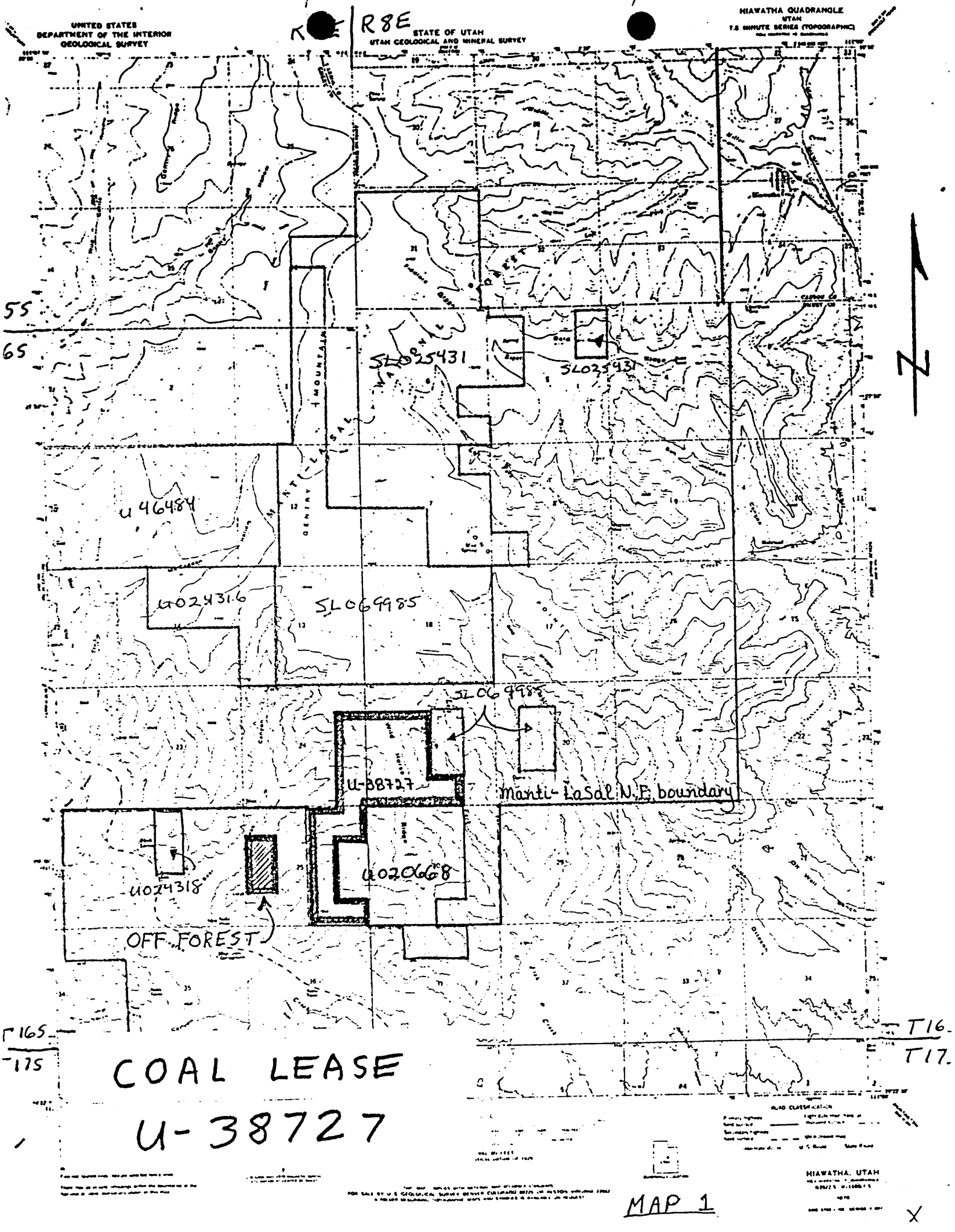
Leasing and development will be under the authority of the following authorizing actions: The Mineral Leasing Act of February 25, 1920, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; the Surface Mining Control and Reclamation Act (SMCRA) of 1977; the Multiple Minerals Development Act of August 4, 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; regulations: Title 43 CFR Group 3400, Group 2800; and Title 30 CFR Group 700; and the Manti-LaSal National Forest Land and Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (FEIS), 1986.

C. Land Description

Federal Coal Lease U-38727 is located in Emery County, Utah, mostly within the Manti-LaSal National Forest, Price Ranger District. It lies near Huntington Canyon on the southern flank of Wild Horse Ridge, along the east-central rim of the Wasatch Plateau coal field (see Map 1). The lease is legally described as follows:

Township 16 South, Range 7 East, SLM, Utah.

Section 24, SE 1/4 NE 1/4, E 1/2 SE 1/4
Section 25, N 1/2 NE 1/4, SW 1/4 NE 1/4, SW 1/4 NW 1/4,
NW 1/4 SW 1/4, W 1/2 SE 1/4, SE 1/4 SE 1/4.


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
R8E
STATE OF UTAH
UTAH GEOLOGICAL AND MINERAL SURVEY
HIAWATHA QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)
55
65
SL025431
SL035431
U46484
U024316
SL069985
SL069985
U-38727
Manti-LaSal N.F. boundary
U020668
U024318
OFF FOREST
T16
T17
T165
T175
COAL LEASE
U-38727
HIAWATHA, UTAH

MAP 1

Township 16 South, Range 8 East, SLM, Utah

Section 19, Lots 2, 3, and 4, SE 1/4 NW 1/4, E 1/2 SW 1/4, SW 1/4 SE 1/4.

The SW 1/4 NW 1/4 and the NW 1/4 SW 1/4 contain 80 acres off Forest, and are privately owned with the coal being U.S. owned and managed by the BLM. The remainder of the lease lands contain 660.39 acres on Forest. The total lease acreage is 740.39 acres.

D. Background

The coal lands currently within lease U-38727 were originally contained in lease U-024318. Lease U-024318 was issued May 1, 1958 to Huntington Corporation who later assigned it, in its entirety, to Peabody Coal Company on June 3, 1971. On December 1, 1977, the BLM approved a partial assignment of part of the lease lands creating a new lease which the BLM assigned serial number U-38727. Thus, Peabody Coal Company retained 80 acres (off-Forest) with the original lease number and Nevada Electric Investment Company acquired 740.39 acres under the subject lease. On August 1, 1983, the lease was assigned by Nevada Electric to Beaver Creek Coal Company who considered development of the property. Beaver Creek conducted a helicopter assisted drilling program and filed the Wild Horse Ridge Mine Plan in 1983. Beaver Creek later decided not to pursue further development, withdrew their mine permit application, and assigned the lease back to Nevada Electric effective October 16, 1986.

On March 16, 1979, the Forest Service completed an environmental assessment/technical examination for readjustment of the subject lease (under the encompassing original lease U-024318). On May 22, 1980, the BLM attempted to readjust the lease terms, but Nevada Electric filed an objection on July 18, 1980. On June 9, 1983, the BLM formally waived its rights to readjust the lease.

E. Mine Development

Two off Forest mining scenarios have been developed for the lease and they are described below. The coal could also be extracted with on-lease shaft facilities, but this might prove to not be economically feasible.

In 1978, United States Fuel Company and Nevada Electric jointly submitted an "informal mining plan" to the U.S. Geological Survey. The plan called for the lease to be mined through the existing Mohrland Mine facilities in Cedar Creek Canyon. The Mohrland Mine is located on private land within the Manti-LaSal National Forest. This informal plan was never pursued by either U.S. Fuel or Nevada Electric.

On April 1, 1983, Beaver Creek Coal Company filed a permit application package with the Utah Division of Oil, Gas and Mining (DOGM) and the Office of Surface Mining (OSM) for their proposed Wild Horse Ridge Mine. The proposal included the subject lease and called for surface facilities off-lease on private land in Bear Canyon to

the west. An exploration road was constructed to the proposed mine site and the coal was faced up for testing. The only other work conducted to exploit the coal resources on the subject lease was the aforementioned drilling program. To date, no further development or exploration activities have been proposed.

F. Issues and Concerns

General public comments were solicited through local newspapers on October 10, 1986. Specific comments on the proposed action were solicited directly from the Emery County Planning and Zoning Commission, the Utah Division of Wildlife Resources and the Southern Utah Association of Governments. No comments or responses have been received to date; therefore, no public issues have been identified.

The Forest Service Interdisciplinary (ID) Team identified the following management concerns:

1. Surface disturbing activities and facilities could adversely affect area resources.

2. Underground mining and subsidence could adversely affect surface and ground water, soils, vegetation, and wildlife.

G. Negative Declaration

The ID Team determined that this action, after mitigation, would cause no impacts on the following: prime or unique rangelands, wetlands, timberlands, or farmlands; floodplains; known cultural or paleontological resources; alluvial valley floors; known Threatened, Endangered, or Sensitive plant or animal species.

II. DESCRIPTION OF ALTERNATIVES

A. No Action Alternative

Consideration of the "No Action" alternative is required by Section 1502.14 (d) of the NEPA, and by the Council of Environmental Quality guidelines as specified in the Federal Register on November 29, 1979. Under this alternative, the terms of the lease would not be changed.

Department of Interior Regulation 43 CFR 3451.1 (a) (1) Federal Coal Management Regulations require that all leases issued prior to August 4, 1976, be subject to readjustment at the end of the current 20-year period and at the end of each 10-year period (under which this lease qualifies), thereafter. The present lease terms do not minimize the impacts to the surface resources to an acceptable level pursuant to the Forest Plan, and new management requirements are needed.

B. Readjustment of Terms Alternative

Department of Interior Regulations 43 CFR 3400.3-1 pertaining to Coal Management make provision for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to

prescribe conditions to insure the use and protection of the lands. This lease contains lands the surface of which are managed by the United States Department of Agriculture, Forest Service, Manti-LaSal National Forest.

The stipulations contained in Appendix A pertain to the Lessee responsibility for mining operations on the lease area on adjacent areas as may be specifically designated on National Forest System (NFS) lands.

III. AFFECTED ENVIRONMENT

The affected environment of the subject areas has been generally described in numerous environmental documents and resource reports prepared for coal leasing and development in this and surrounding areas. Two of these documents are listed for reference in Section VI, Selected Tiering and Reference Documents. There are several resources on the lease for which concern was identified. These resources are essentially unique to the proposal and are under consideration in this document.

A. Topography

The lease area is located on the southern end of Gentry Mountain and situated on the southern end of Wild Horse Ridge overlooking Huntington Canyon. This narrow ridge is carved by Bear Creek, Fish Creek, and two smaller canyons. This area characteristically has steep cliffs and deeply incised drainages. Slopes on canyon walls range from 60 percent to vertical. A "stair-step" appearance is given by the resistant sandstone outcrops mantled by sandstone talus.

B. Geology

The lease area is located on the Wasatch Plateau, a transitional zone between the Basin and Range physiographic province to the west and the Colorado Plateau physiographic province to the east. The Wasatch Plateau has geological characteristics of both provinces.

The rock strata found on the lease are (in order from older to younger): the Star Point Sandstone, Blackhawk Formation, Castlegate Sandstone, Price River Formation, and North Horn Formation. These are essentially flat lying sedimentary rocks; sandstone, limestone, and shale which display interbedding and crossbedding structures, and contain lenticular sandstone bodies. The strata dip about five to eight degrees to the southwest.

Mass movement (rock falls, slumps, soil creep, etc.) is a major consideration on the lease. Along Wild Horse Ridge (especially on the eastern face), slumps are as large as one acre. Further south along the ridge they are small to unnoticeable. All of the slumps and slides occur within the North Horn and Price River Formations. In many cases, springs and seeps are found in close proximity to these movements.

The commercial coal beds on the lease are in the Blackhawk Formation. They occur in the canyon walls between 7,500 and 8,000 feet above sea level. The Blackhawk has an average thickness of about 900 feet on the lease. Its composition varies from sandstones to shales. It contains sandstone lenses, with common fluctuation in bed thicknesses.

Two coal seams of economic importance occur on the lease. The lower seam is the Hiawatha, lying directly above the contact of the Blackhawk and the Star Point sandstone. According to Doelling (1967), it ranges in thickness from six to eight feet. The upper seam is the Blind Canyon which lies about 90 to 100 feet above the Hiawatha. This seam varies in thickness from six to ten feet.

The lease is found to be in a high seismic risk zone. This increases the possibility of mine damage and safety hazards through roof falls, landslides, and rockfalls.

C. Ground water

Ground water surfaces as springs and seeps at elevations ranging from 7,300 to 9,200 feet. The majority of the springs and seeps occur within the Blackhawk Formation between 7,600 and 8,400 feet. Many of the springs are closely associated with lithologic contacts, where there is a change in permeability.

The Price River Formation is found between the Castlegate Sandstone and North Horn Formation. While some of the contact areas do not display any flow of water, there is a notable change in soil moisture content along the upper and lower contacts of the formation which is observed by the growth of riparian vegetation.

Within the North Horn Formation there are four sizeable springs. These occur in intermittent streambeds and may be related to the flow of ground water intersecting the profile of the flow of surface water.

Ground water storage and flow is the direct result of the interrelated geologic and topographic features. The faults and associated sympathetic joints may play a part in the channelization of ground water flow. Canyons and ridges follow the trend of these faults and a few springs are found along them. More frequently, seep areas that are intermittent occur along these faults.

D. Soils

Soils on the lease area have developed from colluvial and residual parent material. Slopes have a general southerly aspect.

Soils are generally less than 20 inches deep. Textures for surface and subsurface soils are very gravelly and cobbly loams and clay loams. Coarse fragments range from 35 to 60 percent. The color of the surface soil is dark brown.

With existing use, the erosion from these soils is estimated to be four tons per acre per year (Land Type 107). Using sediment yield and loss of soil productivity as criteria, this rate is considered low. Disturbance of the soils by activities that completely remove the natural protective surface cover and disrupt the natural physical condition of the soil, is estimated to increase the erosion to between four to seven tons per acre. This rate is considered high. Accelerated erosion will continue at a decreasing rate over time as a protective soil cover becomes established. Since these soils have a low fertility level (due to high coarse fragments, low available water, shallow soils and low organic matter), naturally revegetating to the present vegetative state will take many years. Special revegetative measures (topsoiling, mulching, seeding, fertilizing, etc.) will decrease the time for establishment. Revegetation under these practices will be expensive and still take many years. Rock fall occurs in this unit in areas where the slope is greater than 80 percent; the source being the natural disintegration of the sandstone cliffs. Soil creep occurs mainly on slopes greater than 55 percent. These are generally fine textured soils underlain by decomposed shales. Slump failures were observed near the upper slopes of the area.

E. Climate

The climate of the lease area is generally cool and dry. Precipitation and temperature vary with elevation. Storage rain gages at similar elevations in nearby Joe's Valley average 14.6 inches at valley stations to 19 inches on ridges. Most of the precipitation, approximately two-thirds, comes in the form of snow during the months of October through April. The maximum snow accumulation occurs about the first of March each year. Snow depths average about 27 inches. Snow accumulation varies considerably with local topography. The eastern sides of ridges and the north-facing slopes accumulate the most snow. South-facing slopes are snow-free for much of the winter.

The thermal characteristics vary with elevation. Mean annual temperatures vary from 43.5 degrees Fahrenheit in the bottom of Bear Canyon to 32 degrees Fahrenheit on Wild Horse Ridge. The annual frost-free periods for these same sites are 100 days and 40 days respectively. Mean maximum and minimum temperatures for January are 28 degrees Fahrenheit and 18 degrees Fahrenheit respectively. July mean maximum and minimum temperatures are 84 degrees Fahrenheit and 52 degrees Fahrenheit respectively.

F. Hydrology

The hydrologic properties of the lease area are highly variable. The source and magnitude of surface runoff vary with land condition, elevation, geology and soils. Using aerial photography to denote this variation, two areas were delineated by hydrologic responses and grouped. The Incipient Runoff Area comprises the more gently sloping top of the elongate Wild Horse Ridge. The High Runoff-Flood Source Area comprises the remainder of the lease area. The hydrologic response groups are summarized as follows:

Incipient Runoff Group - This group produces small amounts of surface runoff nearly every year. High intensity storms produce overland flow. Snowmelt also produces runoff. Drainage patterns are weakly incised on side slopes, but may have deep cross sections where rills empty into stream channels. Valley bottoms have good potential for mitigating short-term impacts, but can produce very large amounts of sediment if disturbed for a sustained period of several seasons. Sediment delivery from this group is generally high if not buffered.

High Runoff-Flood Source Group - This group has a high runoff potential and presents the greatest problems due to steep slopes and sparse vegetation. Soil cover is minimal. Summer runoff may generate high flow rates. In 1976, the left fork of Bear Canyon was the source area for a mud rock flow which caused considerable damage to a bridge down canyon. Much of the area covered by this group has the potential to create this type of flow, and severely increase sediment production and transport with high intensity runoff.

The lease area is within the drainages of Fish Creek and Bear Creek both of which are tributary to Huntington Creek. Huntington Creek is part of the municipal water supply for the community of Huntington. Huntington Creek is the industrial water supply for the Huntington Power Plant. Increased sediment in the water of Huntington Creek will increase the operating costs for both water supplies. There is no available water quality data for Fish Creek. Samples of Bear Creek from 1982 to 1984 show suspended solids range from342 to 20,000 parts per million. The sediment source is the unstable slopes of the canyon.

Any development that would aggrevate the instability and/or increase the sediment loads should be avoided.

G. Wildlife and Fish

The lease falls within the Utah Division of Wildlife Resources deer herd unit #34 and elk herd unit #12. Most of the big game use was found to be in the mahogany, aspen, and sagebrush cover types. The use in these cover types averaged 10, 12, and 17 deer days per acre, respectively. The elk use was concentrated primarily in the mahogany type, amounting to an average 18 elk days per acre. Deer use this area for summer and some winter range, pulling back into the timber for cover.

The diversity of vegetative types on the leases supports a diverse wildlife population. Besides deer and elk, other game and fur-bearing species may include: black bear, cougar, bobcat, red fox, grey fox, badger, coyote, snowshoe hare, and mink. Avifauna of the area may include several species of hawks, owls, Golden Eagle, jays, and sparrows. Because of the diversity of habitat components, there are probably many small mammals and songbirds found on the lease sites which are too numerous to list in detail in this report.

There are no fisheries within the lease but Bear Creek flows into Huntington Creek, which is an important fishery. Most of the more valuable fishery sections of Huntington Creek are upstream from the lease areas.

The lease area was investigated for Threatened or Endangered animal species. There are no Threatened or Endangered wildlife species known to inhabit the lease area.

The Endangered American Bald Eagle is known to winter throughout this region.

H. Vegetation

Coniferous tree species such as the Douglas fir, Englemann spruce, and both alpine and white fir occur on the north and east slopes in the canyons. Some Quaking aspen is found growing on the wetter benches and in the canyon bottoms. Bristlecone pine and some limber pine can be found growing on the higher elevation, open rocky, windy, exposed ridgetops.

Utah juniper and pinyon pine dominate the vegetation on the south and west slopes. Within the area, sagebrush, rabbit brush, mountain mahogany, serviceberry, snowberry, and wood rose are the shruby plant species that are found within the area. Grass that is found on the steep south slopes is mostly hard grass and red fescue. Wheat grass, bromes, and needle grass are common on the slope and in the canyon bottoms.

There are many species of forbs common to this lease area. The canyon sweetvetch (Hedsarum occidentalis var. cannone), a sensitive plant species, is also known to occur in the canyon bottoms just outside the lease area in lower Bear Creek. This plant could be within the lease area.

IV. ENVIRONMENTAL CONSEQUENCES

A. Effects of Implementation

There would be no effects to the environment unless coal is produced from the lease and/or surface disturbing operations are conducted.

If the lease is mined, effects would result from deformation of the overburden and subsidence of the land surface. Additional effects would result from any surface disturbing activities such as coal exploration, construction of surface facilities for mining and the other activity associated with surface operations.

The environmental consequences for both alternatives will be essentially the same but may differ in magnitude. Under the terms and conditions contained in the existing lease (No Action Alternative), the environmental consequences may not be as thoroughly mitigated and potential operators may not receive advance notice of requirements for developments of the lease.

If the lease is readjusted, the stipulations contained in Appendix A would be included in the lease and the anticipated effects would be mitigated to the maximum degree practical.

B. Short-Term and Residual Impacts

Surface disturbing operations would result in degradation of surface water quality, increased soil erosion, removal of vegetation and the associated disturbance to wildlife from human activities and presence.

If the lease is mined, subsidence would occur at the surface. The amount and extent of subsidence would depend on the mining method, configuration of the workings, number of seams mined and the geologic factors which control the strength of the overburden. Stresses and deformations produced in mine workings, other coal seams and the overburden may effect mine safety, extraction efficiency, ground water flow and the surface environment.

Subsidence begins almost immediately upon mining and may continue for many years after the working area is abandoned. The rate, extent and amount of subsidence will vary with the geologic conditions and mining operations.

It is expected that mining and subsidence will have an effect upon the natural ground water flow which may, in turn, result in effects to surface water, soils, vegetation, wildlife habitat and land uses.

C. Short-Term Use Vs. Long-Term Productivity

Construction of facilities and operations would involve long-term uses and disturbance. The duration would be dependent on the life of the mining operation and the additional time required for revegetation of the disturbed areas following reclamation.

Underground mining and subsidence could involve long-term alteration of the ground water flow and associated effects to surface resources. The long-term productivity could be altered as drainages, soils and vegetation gradually adjust to any modified ground water conditions. The productivity could decrease or increase depending on the amount of available water.

D. Irreversible and Irretrievable Commitment of Resources

The resources that would be consumed in coal extraction would not be retrievable, and not available to be used elsewhere once expended. After the coal is mined, its' use by future generations would be irreversibly lost, and the coal left in the ground would not be retrieved.

Subsidence may result in the irretrievable commitment of some of the discussed resources.

E. Cumulative Effects

There are no cumulative effects associated with the readjustment of this lease. Cumulative effects resulting from mining coal could include the effects from subsidence, the effects associated with surface disturbing operations such as coal exploration and construction of mining facilities, and the human activity from continued operations as exists on mines in adjacent areas.

V. PERSONNEL AND PUBLIC DEVELOPMENT

A. Forest Service Interdisciplinary Team

Brent Barney, Civil Engineer
Bill Boley, Forest Engineer
Jo Ellis, Geologist
Lee Foster, Forest Planner
Ira Hatch, District Ranger
Jim Jensen, Landscape Architect
Dennis Kelly, Hydrologist
Dan Larsen, Soil Scientist
Leland Matheson, Range Conservationist
Walter Nowak, Geologist - Team Leader
Carter Reed, Geologist
Gary Say, Forester
Bob Thompson, T&E Specialist

B. Other Organizational and Public Involvement

See section I. F. of this EA.

VI. SELECTED TIERING AND REFERENCE DOCUMENTS

A. Environmental Assessment/Technical Examination for the Readjustment of Federal Coal Lease U-024318, 3/16/79.

B. Manti-LaSal National Forest Environmental Impact Statement and Land and Resource Management Plan, 11/86.

SPECIAL STIPULATIONS

Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service - Manti-LaSal National Forest.

The following stipulations pertain to the Lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

Forest Service Stipulation #1.

Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the Lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

f cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the Lessee prior to disturbance shall immediately bring them to the attention of the appropriate authority. Paleontological remains of significant scientific interest do not include leaves, ferns or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

Forest Service Stipulation #2.

If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports and carrying out mitigating measures shall be borne by the Lessee.

Forest Service Stipulation #3.

The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

Forest Service Stipulation #4.

Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

Forest Service Stipulation #5.

The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major improvements to existing developments to examine alternatives and mitigate conflicts.

Forest Service Stipulation #6.

The Lessee shall be required to establish a monitoring system to locate, measure and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

Forest Service Stipulation #7.

The Lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), Lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

Forest Service Stipulation #8.

Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would:) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The Lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

Forest Service Stipulation #9.

In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specific approved locations.

Forest Service Stipulation #10.

If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

Forest Service Stipulation #11.

The coal contained within, and authorized for mining under this lease shall be tracted only by underground mining methods.

Forest Service Stipulation #12.

Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

Forest Service Stipulation #13.

In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specified periods of the year.

Forest Service Stipulation #14.

The Lessee, at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed or displaced corner monuments (section corners, 1/4 corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.) or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by a professionsl land surveyor registered in the State of Utah, and to the standards and guidelines found in the Manual of Surveying Instructions, United States Department of the Interior.

Forest Service Stipulation #15.

The Lessees, at their expense, will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

Forest Service Stipulation #16

STIPULATION FOR LANDS OF THE NATIONAL FOREST SYSTEM UNDER JURISDICTION OF THE DEPARTMENT OF AGRICULTURE

The licensee/permittee/lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/prospecting permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest development roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operating plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed

to Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price,Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

_____

Signature of Licensee/Permittee/Lessee

Wild Horse Ridge cc: Daron

DECISION NOTICE
AND
FINDING OF NO SIGNIFICANT IMPACT
FOR THE READJUSTMENT OF
FEDERAL COAL LEASE U-020668

USDA FOREST SERVICE
INTERMOUNTAIN REGION (R-4)
MANTI-LASAL NATIONAL FOREST
PRICE RANGER DISTRICT

USDI BUREAU OF LAND MANAGEMENT
STATE OF UTAH
MOAB DISTRICT
SAN RAFAEL RESOURCE AREA

On March 19, 1986, the Forest Service received notification from the Bureau of Land Management that Federal Coal Lease U-020668 would be subject to readjustment of terms and conditions on May 1, 1988. This notification required conducting an environmental analysis of the proposed action pursuant to the National Environmental Policy Act of 1969. A Forest Service Interdisciplinary (ID) Team met on September 3, 1986 to evaluate the proposal. As the surface management agency for the majority of the lease, the Forest Service prepared the Environmental Assessment (EA) in consultation with the Bureau of Land Management.

Leasing and development will be under the authority of the following authorizing actions: The Mineral Leasing Act of February 25, 1920, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; the Surface Mining Control and Reclamation Act (SMCRA) of 1977; the Multiple Minerals Development Act of August 4, 1977; the National Environmental Policy Act (NEPA) of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; regulations: Title 43 CFR Group 3400, Group 2800; and Title 30 CFR Group 700; and the Manti-LaSal National Forest Land and Resource Management Plan and Final Environmental Impact Statement, 1986.

Based on the EA, the responsible officials of the Forest Service and Bureau of Land Management have decided that readjustment of the lease, subject to the stipulations contained in Appendix A of the EA, is a viable alternative under existing laws, regulations, policies, management decisions, and direction. The No Action Alternative was evaluated and determined not to be viable as it would allow continuation of the lease under terms inconsistent with the Manti-LaSal National Forest Land and Resource Management Plan and Final Environmental Impact Statement, 1986.

Based on the analysis presented in this EA, the Forest Service consents to approval of the proposed readjustment for that portion of the lease within the Forest, subject to the stipulations in Appendix A of the EA.

This is not a major Federal action that would significantly affect the quality of the human environment; therefore, an Environmental Impact Statement is not needed. This determination was made considering the following factors:

1. No new surface disturbing operations or facilities are proposed at this time. If surface disturbing operations or facilities are proposed in the future, a site-specific environmental assessment will be prepared at that time. Additional stipulations may be specified as needed to protect the environment.

2. The identified impacts, including cumulative effects, can be effectively mitigated to an acceptable level.

3. No known prime or unique farmlands, wetlands, timber lands, or rangelands; floodplains; alluvial valley floors; paleontological or cultural resources; nor threatened, endangered, or sensitive floral or faunal species will be impacted by readjustment of this lease.

4. Readjustment of this lease is consistent with the directions and decisions of the Manti-LaSal National Forest Land and Resource Management Plan and Final Environmental Impact Statement, 1986.

The Forest Service decision regarding National Forest System lands is subject to administrative review (appeal) pursuant to 36 CFR 211.18, Secretary of Agriculture Appeal Regulation. A written notice of appeal must be filed with the Intermountain Regional Office in Ogden, Utah, within 45 days of the date of this decision.

for J.S. Tixier, Regional Forester
Intermountain Region

8/31/87
Date

James W. Dryden, Area Manager
San Rafael Resource Area

8/18/87
Date

ENVIRONMENTAL ASSESSMENT
FOR THE READJUSTMENT OF
FEDERAL COAL LEASE U-020668

PRICE RANGER DISTRICT
MANTI-LASAL NATIONAL FOREST
EMERY COUNTY, UTAH

Responsible Official: J.S. Tixier
Regional Forester
Intermountain Region (R-4)
USDA - Forest Service
Federal Building
324 25th Street
Ogden, Utah 84401

For Further Information Contact: George Morris
Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

or: Ira W. Hatch
District Ranger
Price Ranger District
599 West Price River Drive
Price, Utah 84501

Prepared by: Walter E. Nowak, Geologist

RECOMMENDED APPROVAL

Ira W Hatch _____ 7/31/87

District Ranger _____ Date

APPROVED

_____ _____

Forest Supervisor _____ Date

ENVIRONMENTAL ASSESSMENT FOR THE READJUSTMENT OF FEDERAL COAL LEASE U-020668

I. INTRODUCTION

A. Purpose and Need for Action

The Bureau of Land Management (BLM) notified the Forest Service on March 19, 1986 that Federal Coal Lease U-020668, currently leased to Nevada Electric Investment Co., would be subject to readjustment of terms on May 1, 1988. As the surface managing agency for most of this lease area, the Manti-LaSal National Forest is responsible for conducting an Environmental Assessment (EA) of the proposed action pursuant to the National Environmental Policy Act (NEPA) of 1969. Also, the 1984 Interagency Agreement between the BLM and the Forest Service for Mineral Leasing provides for joint scoping and preparation of a single EA and two-part decision document, if appropriate. On May 6, 1987, the Manti-LaSal National Forest formally solicited input for the subject lease from the Moab District BLM office. To date, no formal BLM response has been received; although the Forest was notified to proceed with the on-Forest portion of the lease and the BLM would prepare the appropriate NEPA documentation on their own. This EA will then address the proposed readjustment and identify management requirements for resource protection only for the 546.32 acres of Federal Coal Lease U-020668 that fall within the boundaries of the Manti-LaSal National Forest.

B. Authorizing Actions

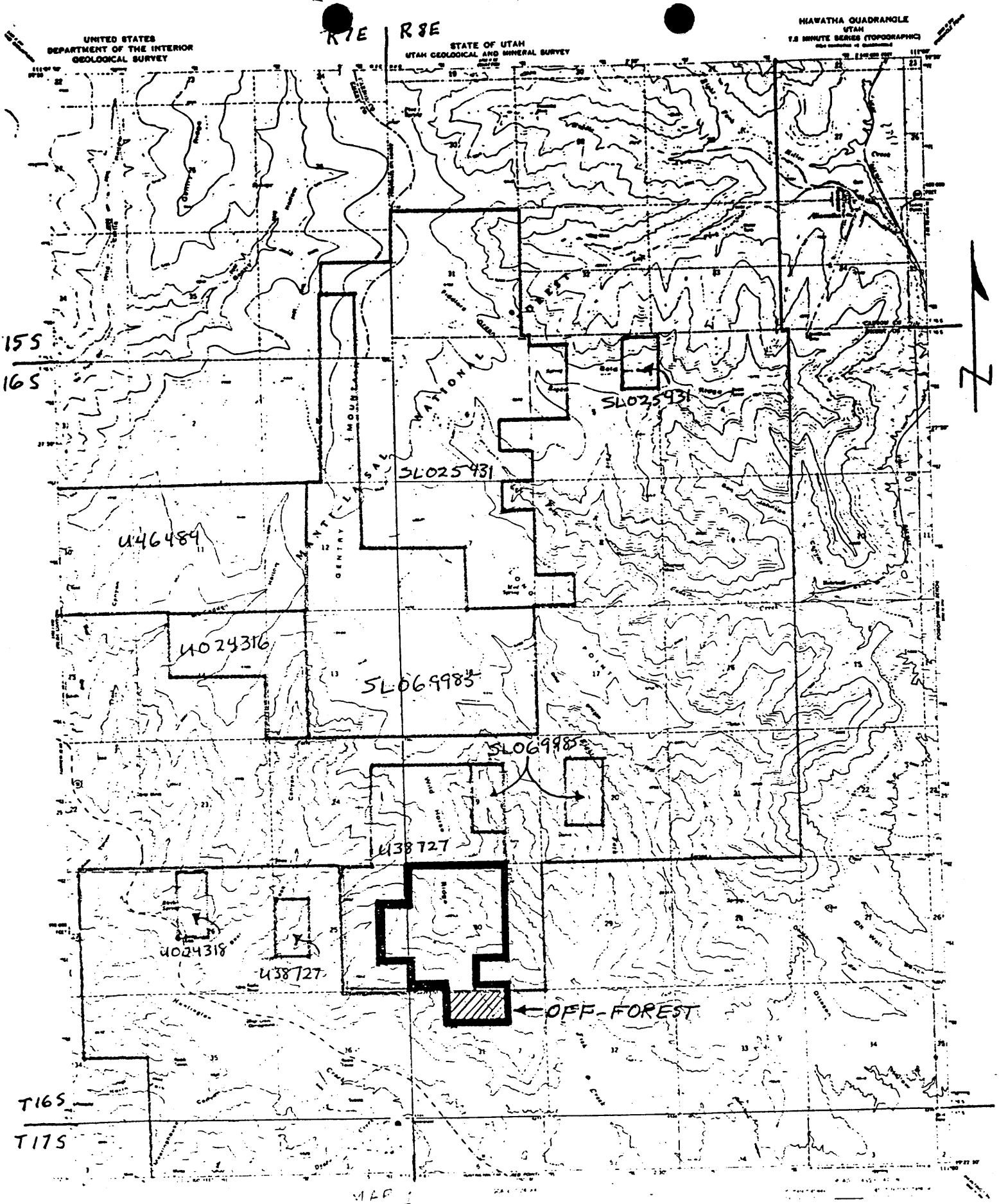
Leasing and development will be under the authority of the following authorizing actions: The Mineral Leasing Act of February 25, 1920, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; the Surface Mining Control and Reclamation Act (SMCRA) of 1977; the Multiple Minerals Development Act of August 4, 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; regulations: Title 43 CFR Group 3400, Group 2800; and Title 30 CFR Group 700; and the Manti-LaSal National Forest Land and Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (FEIS), 1986.

C. Land Description

Federal Coal Lease U-020668 is located in Emery County, Utah, mostly within the Manti-LaSal National Forest, Price Ranger District. It lies near Huntington Canyon on the southern flank of Wild Horse Ridge, along the east-central rim of the Wasatch Plateau coal field (see Map 1). The lease is legally described as follows:

Township 16 South, Range 7 East, SLM, Utah.
Section 25, SE 1/4 NE 1/4, NE 1/4 SE 1/4

Township 16 South, Range 8 East, SLM, Utah.
Section 30, W 1/2, W 1/2 NE 1/4, NW 1/4 SE 1/4
Section 31, NE 1/4 NW 1/4, NW 1/4 NE 1/4


R7E
R8E
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF UTAH
UTAH GEOLOGICAL AND MINERAL SURVEY
HIAWATHA QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)
15S
16S
T16S
T17S
SL025931
SL025931
U46484
U024316
SL069985
SL069985
U38727
U024318
U38727
OFF-FOREST
MAP 1

U 020668

The lands in Section 31 are off Forest and contain 80 acres managed by the BLM. The remainder of the lease lands contain 546.32 acres on Forest. The total lease acreage is 626.32.

D. Background

Lease U-020668 was issued on May 1, 1958 to Huntington Corporation of Nevada (later called Rilda Corporation and Huntington Corporation of Menlo Park, California). In 1971, Huntington Corporation transferred ownership of the lease to Peabody Coal Company. In 1977, Peabody Coal Company transferred the lease to Nevada Electric Investment Company. On August 1, 1983, the lease was assigned by Nevada Electric to Beaver Creek Coal Company who considered development of the property. Beaver Creek conducted a helicopter assisted drilling program and filed the Wild Horse Ridge Mine Plan in 1983. Beaver Creek later decided not to pursue further development, withdrew their mine permit application, and assigned the lease back to Nevada Electric effective October 16, 1986.

On March 16, 1979, the Forest Service completed an environmental assessment/technical examination for readjustment of the subject lease. On May 22, 1980, the BLM attempted to readjust the lease terms, but Nevada Electric filed an objection on July 18, 1980. On June 9, 1983, the BLM formally waived its rights to readjust the lease.

E. Mine Development

Two mining scenarios (both off Forest) have been developed for the lease and they are described below. The coal could also be extracted with on-lease shaft facilities, but this might prove to not be economically feasible.

In 1978, United States Fuel Company and Nevada Electric jointly submitted an "informal mining plan" to the U.S. Geological Survey. The plan called for the lease to be mined through the existing Mohrland Mine facilities in Cedar Creek Canyon. The Mohrland Mine is located on private land within the Manti-LaSal National Forest. This informal plan was never pursued by either U.S. Fuel or Nevada Electric.

On April 1, 1983, Beaver Creek Coal Company filed a permit application package with the Utah Division of Oil, Gas and Mining (DOGM) and the Office of Surface Mining (OSM) for their proposed Wild Horse Ridge Mine. The proposal included the subject lease and called for surface facilities off-lease on private land in ~~Beaver~~ Bear Canyon to the west. An exploration road was constructed to the proposed mine site and the coal was faced up for testing. The only other work conducted to exploit the coal resources on the subject lease was the aforementioned drilling program. To date, no further development or exploration activities have been proposed.

F. Issues and Concerns

General public comments were solicited through local newspapers on October 10, 1986. Specific comments on the proposed action were solicited directly from the Emery County Planning and Zoning Commission, the Utah Division of Wildlife Resources and the Southern Utah Association of Governments. No comments or responses have been received to date; therefore, no public issues have been identified.

The Forest Service Interdisciplinary (ID) Team identified the following management concerns:

1. Surface disturbing activities and facilities could adversely affect area resources.

2. Underground mining and subsidence could adversely affect surface and ground water, soils, vegetation, and wildlife.

G. Negative Declaration

The ID Team determined that this action, after mitigation, would cause no impacts on the following: prime or unique rangelands, wetlands, timberlands, or farmlands; floodplains; known cultural or paleontological resources; alluvial valley floors; known Threatened, Endangered, or Sensitive plant or animal species.

II. DESCRIPTION OF ALTERNATIVES

A. No Action Alternative

Consideration of the "No Action" alternative is required by Section 1502.14 (d) of the NEPA, and by the Council of Environmental Quality guidelines as specified in the Federal Register on November 29, 1979. Under this alternative, the terms of the lease would not be changed.

Department of Interior Regulation 43 CFR 3451.1 (a) (1) Federal Coal Management Regulations require that all leases issued prior to August 4, 1976, be subject to readjustment at the end of the current 20-year period and at the end of each 10-year period (under which this lease qualifies), thereafter. The present lease terms do not minimize the impacts to the surface resources to an acceptable level pursuant to the Forest Plan, and new management requirements are needed.

B. Readjustment of Terms Alternative

Department of Interior Regulations 43 CFR 3400.3-1 pertaining to Coal Management make provision for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. This lease contains lands the surface of which are managed by the United States Department of Agriculture, Forest Service, Manti-LaSal National Forest.

The stipulations contained in Appendix A pertain to the Lessee responsibility for mining operations on the lease area on adjacent areas as may be specifically designated on National Forest System (NFS) lands.

III. AFFECTED ENVIRONMENT

The affected environment of the subject areas has been generally described in numerous environmental documents and resource reports prepared for coal leasing and development in this and surrounding areas. Two of these documents are listed for reference in Section VI, Selected Tiering and Reference Documents. There are several resources on the lease for which concern was identified. These resources are essentially unique to the proposal and are under consideration in this document.

A. Topography

The lease area is located on the southern end of Gentry Mountain and situated on the southern end of Wild Horse Ridge overlooking Huntington Canyon. This narrow ridge is carved by Bear Creek, Fish Creek, and two smaller canyons. This area characteristically has steep cliffs and deeply incised drainages. Slopes on canyon walls range from 60 percent to vertical. A "stair-step" appearance is given by the resistant sandstone outcrops mantled by sandstone talus.

B. Geology

The lease area is located on the Wasatch Plateau, a transitional zone between the Basin and Range physiographic province to the west and the Colorado Plateau physiographic province to the east. The Wasatch Plateau has geological characteristics of both provinces.

The rock strata found on the lease are (in order from older to younger): the Star Point Sandstone, Blackhawk Formation, Castlegate Sandstone, Price River Formation, and North Horn Formation. These are essentially flat lying sedimentary rocks; sandstone, limestone, and shale which display interbedding and crossbedding structures, and contain lenticular sandstone bodies. The strata dip about five to eight degrees to the southwest.

Mass movement (rock falls, slumps, soil creep, etc.) is a major consideration on the lease. Along Wild Horse Ridge (especially on the eastern face), slumps are as large as one acre. Further south along the ridge they are small to unnoticeable. All of the slumps and slides occur within the North Horn and Price River Formations. In many cases, springs and seeps are found in close proximity to these movements.

The commercial coal beds on the lease are in the Blackhawk Formation. They occur in the canyon walls between 7,500 and 8,000 feet above sea level. The Blackhawk has an average thickness of about 900 feet on the lease. Its composition varies from sandstones to shales. It contains sandstone lenses, with common fluctuation in bed thicknesses.

Two coal seams of economic importance occur on the lease. The lower seam is the Hiawatha, lying directly above the contact of the Blackhawk and the Star Point sandstone. According to Doelling (1967), it ranges in thickness from six to eight feet. The upper seam is the Blind Canyon which lies about 90 to 100 feet above the Hiawatha. This seam varies in thickness from six to ten feet.

The lease is found to be in a high seismic risk zone. This increases the possibility of mine damage and safety hazards through roof falls, landslides, and rockfalls.

C. Ground water

Ground water surfaces as springs and seeps at elevations ranging from 7,300 to 9,200 feet. The majority of the springs and seeps occur within the Blackhawk Formation between 7,600 and 8,400 feet. Many of the springs are closely associated with lithologic contacts, where there is a change in permeability.

The Price River Formation is found between the Castlegate Sandstone and North Horn Formation. While some of the contact areas do not display any flow of water, there is a notable change in soil moisture content along the upper and lower contacts of the formation which is observed by the growth of riparian vegetation.

Within the North Horn Formation there are four sizeable springs. These occur in intermittent streambeds and may be related to the flow of ground water intersecting the profile of the flow of surface water.

Ground water storage and flow is the direct result of the interrelated geologic and topographic features. The faults and associated sympathetic joints may play a part in the channelization of ground water flow. Canyons and ridges follow the trend of these faults and a few springs are found along them. More frequently, seep areas that are intermittent occur along these faults.

D. Soils

Soils on the lease area have developed from colluvial and residual parent material. Slopes have a general southerly aspect.

Soils are generally less than 20 inches deep. Textures for surface and subsurface soils are very gravelly and cobbly loams and clay loams. Coarse fragments range from 35 to 60 percent. The color of the surface soil is dark brown.

With existing use, the erosion from these soils is estimated to be four tons per acre per year (Land Type 107). Using sediment yield and loss of soil productivity as criteria, this rate is considered low. Disturbance of the soils by activities that completely remove the natural protective surface cover and disrupt the natural physical condition of the soil, is estimated to increase the erosion to between four to seven tons per acre. This rate is considered high. Accelerated erosion will continue at a decreasing rate over time as

protective soil cover becomes established. Since these soils have a low fertility level (due to high coarse fragments, low available water, shallow soils and low organic matter), naturally revegetating to the present vegetative state will take many years. Special revegetative measures (topsoiling, mulching, seeding, fertilizing, etc.) will decrease the time for establishment. Revegetation under these practices will be expensive and still take many years. Rock fall occurs in this unit in areas where the slope is greater than 80 percent; the source being the natural disintegration of the sandstone cliffs. Soil creep occurs mainly on slopes greater than 55 percent. These are generally fine textured soils underlain by decomposed shales. Slump failures were observed near the upper slopes of the area.

E. Climate

The climate of the lease area is generally cool and dry. Precipitation and temperature vary with elevation. Storage rain gages at similar elevations in nearby Joe's Valley average 14.6 inches at valley stations to 19 inches on ridges. Most of the precipitation, approximately two-thirds, comes in the form of snow during the months of October through April. The maximum snow accumulation occurs about the first of March each year. Snow depths average about 27 inches. Snow accumulation varies considerably with local topography. The eastern sides of ridges and the north-facing slopes accumulate the most snow. South-facing slopes are snow-free for much of the winter.

The thermal characteristics vary with elevation. Mean annual temperatures vary from 43.5 degrees Fahrenheit in the bottom of Bear Canyon to 32 degrees Fahrenheit on Wild Horse Ridge. The annual frost-free periods for these same sites are 100 days and 40 days respectively. Mean maximum and minimum temperatures for January are 28 degrees Fahrenheit and 18 degrees Fahrenheit respectively. July mean maximum and minimum temperatures are 84 degrees Fahrenheit and 52 degrees Fahrenheit respectively.

F. Hydrology

The hydrologic properties of the lease area are highly variable. The source and magnitude of surface runoff vary with land condition, elevation, geology and soils. Using aerial photography to denote this variation, two areas were delineated by hydrologic responses and grouped. The Incipient Runoff Area comprises the more gently sloping top of the elongate Wild Horse Ridge. The High Runoff-Flood Source Area comprises the remainder of the lease area. The hydrologic response groups are summarized as follows:

Incipient Runoff Group - This group produces small amounts of surface runoff nearly every year. High intensity storms produce overland flow. Snowmelt also produces runoff. Drainage patterns are weakly incised on side slopes, but may have deep cross sections where rills empty into stream channels. Valley bottoms

have good potential for mitigating short-term impacts, but can produce very large amounts of sediment if disturbed for a sustained period of several seasons. Sediment delivery from this group is generally high if not buffered.

High Runoff-Flood Source Group - This group has a high runoff potential and presents the greatest problems due to steep slopes and sparse vegetation. Soil cover is minimal. Summer runoff may generate high flow rates. In 1976, the left fork of Bear Canyon was the source area for a mud rock flow which caused considerable damage to a bridge down canyon. Much of the area covered by this group has the potential to create this type of flow, and severely increase sediment production and transport with high intensity runoff.

Portions of the lease area drain through Fish Creek into Huntington Creek. The rest of the lease drains through two small ephemeral channels into Hunting Creek. Huntington Creek provides a portion of the municipal water supply for the community of Huntington. Huntington Creek is the industrial water supply for the Huntington Power Plant. The major water use is for irrigation. Increased sediment in the water of Huntington Creek will increase the operating costs for all water supplies. There is no available water quality data for Fish Creek.

Water quality in Huntington Creek is a concern. Any activity that would add sediment or other materials into the stream should be avoided.

G. Wildlife and Fish

The lease falls within the Utah Division of Wildlife Resources deer herd unit #34 and elk herd unit #12. Most of the big game use was found to be in the mahogany, aspen, and sagebrush cover types. The use in these cover types averaged 10, 12, and 17 deer days per acre, respectively. The elk use was concentrated primarily in the mahogany type, amounting to an average 18 elk days per acre. Deer use this area for summer and some winter range, pulling back into the timber for cover.

The diversity of vegetative types on the leases supports a diverse wildlife population. Besides deer and elk, other game and fur-bearing species may include: black bear, cougar, bobcat, red fox, grey fox, badger, coyote, snowshoe hare, and mink. Avifauna of the area may include several species of hawks, owls, Golden Eagle, jays, and sparrows. Because of the diversity of habitat components, there are probably many small mammals and songbirds found on the lease sites which are too numerous to list in detail in this report.

There are no fisheries within the lease but Fish Creek flows into Huntington Creek, which is an important fishery. Most of the more valuable fishery sections of Huntington Creek are upstream from the lease areas.

The lease area was investigated for Threatened or Endangered animal species. There are no Threatened or Endangered wildlife species known to inhabit the lease area.

The Endangered American Bald Eagle is known to winter throughout this region.

H. Vegetation

Coniferous tree species such as the Douglas fir, Englemann spruce, and both alpine and white fir occur on the north and east slopes in the canyons. Some Quaking aspen is found growing on the wetter benches and in the canyon bottoms. Bristlecone pine and some limber pine can be found growing on the higher elevation, open rocky, windy, exposed ridgetops.

Utah juniper and pinyon pine dominate the vegetation on the south and west slopes. Within the area, sagebrush, rabbit brush, mountain mahogany, serviceberry, snowberry, and wood rose are the shruby plant species that are found within the area. Grass that is found on the steep south slopes is mostly hard grass and red fescue. Wheat grass, bromes, and needle grass are common on the slope and in the canyon bottoms.

There are many species of forbs common to this lease area. The canyon sweetvetch (Hedsarum occidentalis var. cannone), a sensitive plant species, is also known to occur in the canyon bottoms just outside the lease area in lower Bear Creek. This plant could be within the lease area.

IV. ENVIRONMENTAL CONSEQUENCES

A. Effects of Implementation

There would be no effects to the environment unless coal is produced from the lease and/or surface disturbing operations are conducted.

If the lease is mined, effects would result from deformation of the overburden and subsidence of the land surface. Additional effects would result from any surface disturbing activities such as coal exploration, construction of surface facilities for mining and the other activity associated with surface operations.

The environmental consequences for both alternatives will be essentially the same but may differ in magnitude. Under the terms and conditions contained in the existing lease (No Action Alternative), the environmental consequences may not be as thoroughly mitigated and potential operators may not receive advance notice of requirements for developments of the lease.

If the lease is readjusted, the stipulations contained in Appendix A would be included in the lease and the anticipated effects would be mitigated to the maximum degree practical.

B. Short-Term and Residual Impacts

Surface disturbing operations would result in degradation of surface water quality, increased soil erosion, removal of vegetation and the associated disturbance to wildlife from human activities and presence.

If the lease is mined, subsidence would occur at the surface. The amount and extent of subsidence would depend on the mining method, configuration of the workings, number of seams mined and the geologic factors which control the strength of the overburden. Stresses and deformations produced in mine workings, other coal seams and the overburden may effect mine safety, extraction efficiency, ground water flow and the surface environment.

Subsidence begins almost immediately upon mining and may continue for many years after the working area is abandoned. The rate, extent and amount of subsidence will vary with the geologic conditions and mining operations.

It is expected that mining and subsidence will have an effect upon the natural ground water flow which may, in turn, result in effects to surface water, soils, vegetation, wildlife habitat and land uses.

C. Short-Term Use Vs. Long-Term Productivity

Construction of facilities and operations would involve long-term uses and disturbance. The duration would be dependent on the life of the mining operation and the additional time required for revegetation of the disturbed areas following reclamation.

Underground mining and subsidence could involve long-term alteration of the ground water flow and associated effects to surface resources. The long-term productivity could be altered as drainages, soils and vegetation gradually adjust to any modified ground water conditions. The productivity could decrease or increase depending on the amount of available water.

D. Irreversible and Irretrievable Commitment of Resources

The resources that would be consumed in coal extraction would not be retrievable, and not available to be used elsewhere once expended. After the coal is mined, its' use by future generations would be irreversibly lost, and the coal left in the ground would not be retrieved.

Subsidence may result in the irreversible commitment of some of the discussed resources.

E. Cumulative Effects

There are no cumulative effects associated with the readjustment of this lease. Cumulative effects resulting from mining coal could include the effects from subsidence, the effects associated with

surface disturbing operations such as coal exploration and construction of mining facilities, and the human activity from continued operations as exists on mines in adjacent areas.

V. PERSONNEL AND PUBLIC DEVELOPMENT

A. Forest Service Interdisciplinary Team

Brent Barney, Civil Engineer
Bill Boley, Forest Engineer
Jo Ellis, Geologist
Lee Foster, Forest Planner
Ira Hatch, District Ranger
Jim Jensen, Landscape Architect
Dennis Kelly, Hydrologist
Dan Larsen, Soil Scientist
Leland Matheson, Range Conservationist
Walter Nowak, Geologist - Team Leader
Carter Reed, Geologist
Gary Say, Forester
Bob Thompson, T&E Specialist

B. Other Organizational and Public Involvement

See section I. F. of this EA.

VI. SELECTED TIERING AND REFERENCE DOCUMENTS

A. Environmental Assessment/Technical Examination for the Readjustment of Federal Coal Lease U-020668, 3/16/79.

B. Manti-LaSal National Forest Environmental Impact Statement and Land and Resource Management Plan, 11/86.

STIPULATION FOR LANDS OF THE NATIONAL FOREST SYSTEM UNDER JURISDICTION OF THE DEPARTMENT OF AGRICULTURE

e licensee/permittee/lessee must comply with all the rules and regulations of e Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of deral Regulations governing the use and management of the National Forest System FS) when not inconsistent with the rights granted by the Secretary of the terior in the license/prospecting permit/lease. The Secretary of Agriculture's les and regulations must be complied with for (1) all use and occupancy of the S prior to approval of a permit/operation plan by the Secretary of Interior, (2) es of all existing improvements, such as Forest development roads, within and tside the area licensed, permitted or leased by the Secretary of Interior, and 3) use and occupancy of the NFS not authorized by a permit/operating plan pproved by the Secretary of the Interior.

ll matters related to this stipulation are to be addressed

o Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price,Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

_____

Signature of Licensee/Permittee/Lessee

SPECIAL STIPULATIONS

Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service - Manti-LaSal National Forest.

The following stipulations pertain to the Lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

Forest Service Stipulation #1.

Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the Lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

... cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the Lessee prior to disturbance shall immediately bring them to the attention of the appropriate authority. Paleontological remains of significant scientific interest do not include leaves, ferns or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

Forest Service Stipulation #2.

If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports and carrying out mitigating measures shall be borne by the Lessee.

Forest Service Stipulation #3.

The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

Forest Service Stipulation #4.

Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

Forest Service Stipulation #5.

The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major improvements to existing developments to examine alternatives and mitigate conflicts.

Forest Service Stipulation #6.

The Lessee shall be required to establish a monitoring system to locate, measure and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

Forest Service Stipulation #7.

The Lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), Lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

Forest Service Stipulation #8.

Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The Lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

Forest Service Stipulation #9.

In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specific approved locations.

Forest Service Stipulation #10.

If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

Forest Service Stipulation #11.

The coal contained within, and authorized for mining under this lease shall be extracted only by underground mining methods.

Forest Service Stipulation #12.

Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

Forest Service Stipulation #13.

In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specified periods of the year.

Forest Service Stipulation #14.

The Lessee, at the conclusion of the mining operation, or at other times as rface disturbance related to mining may occur, will replace all damaged, disturbed or displaced corner monuments (section corners, 1/4 corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.) or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by a professionsl land surveyor registered in the State of Utah, and to the standards and guidelines found in the Manual of Surveying Instructions, United States Department of the Interior.

Forest Service Stipulation #15.

The Lessees, at their expense, will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

GENTRY MOUNTAIN
CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA)

For

STAR POINT MINE
C/007/006

HIAWATHA MINES COMPLEX
C/007/011

DEER CREEK MINE WASTE ROCK STORAGE FACILITY
C/015/018

TRAIL CANYON MINE
C/015/021

BEAR CANYON MINE
C/015/025

in

CARBON AND EMERY COUNTIES, UTAH

June 21, 2001

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I. INTRODUCTION

This CHIA (Cumulative Hydrologic Impact Assessment) predicts potential cumulative impacts to the hydrologic balance, associated with past, present and anticipated coal-mining operations within the CIA (Cumulative Impact Area). The CHIA determines whether material damage effects outside the individual permit boundaries will result from mining activities.

The CHIA document will:

1. Identify the Cumulative Impact Area (CIA). **(Part II)**
2. Describe the hydrologic system and its water resources. **(Part III)**
3. Predict hydrologic impacts. **(Part IV)**
4. Assess material damage. **(Part V)**
5. Make a statement of findings. **(Part VI)**

This CHIA has been prepared by the Utah Division of Oil, Gas, and Mining (UDOGM) and complies with Federal and Utah coal regulations 30 CFR 784.14(f) and R645-301-729, respectively. The last CHIA conducted was revised March 1994, for the Star Point Mine Lease Addition. In addition to the references cited, information was obtained from the Mining and Reclamation Plans (MRP) of the Bear Canyon, Star Point, Hiawatha, and Trail Canyon Mines and the Deer Creek Mine waste rock storage facility. A majority of the geologic information was obtained from the Star Point Mine (Star Point Mine Plan).

II. CUMULATIVE IMPACT AREA (CIA)

The Gentry Mountain Cumulative Impact Area (CIA) is located near Price, Utah, within the Transition Province between the Great Basin and Colorado Plateau. The CIA surrounds Gentry Mountain Ridge, which lies south of the town of Scofield in Carbon County and north of Huntington City in Emery County (Map 1). The area of interest can be found on the Hiawatha, Wattis, Candland Mountain, and Huntington U. S. Geological Survey (USGS) 7.5 minute quadrangles.

The CIA is shown in detail on Map 2. This CIA is the region where past, present, and anticipated or foreseeable future coal mining activities may interact to affect surface and ground water. The CIA boundary incorporates mined areas and proposed lease areas at the Star Point, Hiawatha, Trail Canyon, and Bear Canyon Mines and at the Deer Creek refuse pile. The CIA is defined based on the potential for the hydrologic resources to be impacted by mining activities. Both the surface and the ground-water impact areas are within the CIA outlined in Map 2.

Surface waters from the CIA flow from the eastern divide of the Wasatch Plateau to either the Price River or the San Rafael River. These rivers then discharge to the Green River before its confluence with the Colorado River.

Ground water from the CIA includes all ground water known to flow through or originate within the anticipated mining area and includes all known aquifer discharge points that have the potential to be in hydrologic connection with the mines. Determination of the ground-water CIA boundary has been based on the major geologic features that control ground-water flow. Ground waters issue from alluvial and colluvial aquifers, perched aquifers, channel sandstones and other water bearing lithologies, and fault and fracture systems within the CIA.

MINING HISTORY

MINING ACTIVITIES IN THE CIA.

The history of mining at the Star Point, Hiawatha, Trail Canyon and Bear Canyon Mines and the Deer Creek refuse pile is summarized below. Areas that have been mined within the permitted sites are also shown on Maps 2, 3 and 4.

Star Point Mine (Cyprus Plateau Mining Corporation - Permit C/007/006)

Mining associated with the Star Point Mine began in 1917 prior to the Surface Mining Coal Reclamation Act (SMCRA). The Lion Coal Company operated Wattis No. 1 and No. 2 Mines until the end of 1963. Mining was idled until 1967 when Plateau Mining, Ltd. mined within the Hiawatha Coal Seam and the Wattis Coal Seam from the Star Point No. 1 and Star Point No. 2 Mines. In the fall of 1971, United Nuclear Corporation acquired the Star Point Mines. Since July 21,1980 coal mining and reclamation have been conducted by Cyprus Plateau Mining Corporation (CPMC).

Table II-1. Star Point Mine Extracted Coal		
Company	Time Period	Raw Coal Removed (tons)
Lion Coal Company	1917 - 1963	12,000,000
Plateau Mining Ltd.	1967 - 1971	750,000
United Nuclear Corporation	1971 - 1980	5,000,000
Cyprus Plateau Mining Corporation	1980 - 1990	12,000,000
	1991	no information
	1992	2,100,000
	1993	3,000,000
	1994	no information
	1995	no information
	1996	2,900,000 *
	1997	1,350,000 *
	1998	92,000 *
	1999	1,055,000 *
	2000	in reclamation

* Jahan Bani, 1997, 1998, 1999, 2000

The Star Point Mine developed six portal "units" within the permit area, a "unit" being an area containing several portals. The Star Point No. 1 and the South Wattis units have been sealed and reclaimed. A third portal unit at the Star Point No. 2 Mine, located on the Lion Deck, was sealed in January 2001. The Corner Canyon fan area, the fourth unit, has three portal entries and the Mudwater Canyon fan unit, the fifth unit, has five portal entries, all of which were sealed and reclaimed in 2000. The two breakouts of the sixth unit, located in a side drainage north and west of the Mudwater Canyon fan unit, were sealed and reclaimed in 1994. Three additional portals were approved for Little Park Canyon but were never built.

The Wattis, Third (Middle), and Hiawatha Seams were mined within the Star Point Mine permit area. Early development occurred on the east side of the Bear Canyon Fault (Map 3), while later mining west of the Bear Canyon Graben was accessed by a 3-main-entry rock tunnel constructed through the graben in 1989. Coal was removed through the Lion Deck Portal Area, which was developed in October 1977.

CPMC ceased coal-mining operations in 1999 and began reclamation. The Star Point No. 2 Mine's maximum annual coal capacity was approximately 3.5 million raw tons. Currently CPMC has no leasehold interest, options, or pending bids on lands contiguous to the permit area.

Bear Canyon Mine (Coal Development Company - Permit C/0015/025)

Mining associated with the Bear Canyon Mine began in 1938, prior to SMCRA. C. O. P. Coal Development Company acquired fee coal lands and federal coal leases U-2431 and U-24318 in the Bear Canyon area from Peabody Coal Company in 1980, and mining operations began in 1982. C.O.P. obtained federal coal leases U-020668 and U-38727 from Nevada Electric Investment Company in 1992. C.O.P. also holds federal coal leases U-46484, U-61048, and U-61049 to the north and east of the Bear Canyon Mine. All together, C.O.P. controls approximately 8,000 acres in and adjacent to Bear Canyon.

Co-Op Mining Company has leased 3,336.18 acres from C.O.P. for the Bear Canyon Mine permit: federal leases U-38727, U-020668, and part of U-24316, plus approximately 1,600 acres of fee coal land. In 1997, Jahan Bani estimated that Co-Op Mining Company controlled more than 30 million tons of coal reserves east and west of Bear Canyon.

There are four coal seams at the Bear Canyon Mine; these are - from highest to lowest - the Tank, Upper Bear, Blind Canyon, and Hiawatha Seams. No mining has occurred in the Upper Bear Seam. Mining is conducted by room and pillar mining methods. Main access is through the Bear Canyon #1 Mine portal to the Blind Canyon Seam and the Bear Canyon #2 Portal to the Tank Seam. There is a Hiawatha portal, but a rock tunnel from the #1 Mine is the main access. Production began in the Hiawatha Seam in 1987: production was limited because the coal was scoured by channel-sand formations, but further mining is still considered a possibility. First mining from the Blind Canyon seam occurred during 1983 through 1996, and production began in the Tank Seam in 1994. As of 2001, Co-Op is retreat mining the Blind Canyon and Tank Seams in federal lease U-024316 and fee coal lands.

Mines #3 and #4 are planned for the Wild Horse Ridge area to access the Tank and Blind Canyon Seams: six portals are anticipated. Initial access to the Tank Seam in the #4 Mine will be through a rock tunnel from the #3 Mine. The Tank Seam does not crop out in the Wild Horse Ridge area, and the portals for the #4 Mine will be constructed by breakout once a location with suitable conditions is identified.

Annual production from Co-Op prior to 1996 was 400,000 to 500,000 tons per year according to the 1996 State Coal Production Review, and the annual coal production for 1996 was 581,000 short tons (Jahan Bani, 1997). Annual production was 570,000 tons in 1997, 660,000 tons in 1998, and 881,000 tons in 1999 (Jahan Bani, 1998, 1999, and 2000). Recoverable Reserves are estimated at 15,800,000 (Bear Canyon Mine Plan, Table 3.4-1)

Hiawatha Mine (U.S. Fuels Company - Permit C/007/011)

Mining associated with the Hiawatha mine began prior to SMCRA in the areas identified in Table II-2 (refer to Maps 3 and 6 for general locations). Several portals were associated with pre-SMCRA mining. From 1948 to 1975 the portals at the South Fork mine yard supported the King 1 and King 3 Mines, which are interconnected underground. Three prospect portals were developed in the B seam during that time. The three portals of the King No. 5 Mine and the four portals of the adjacent King 4 Mine were on the south side of the Middle Fork Mine Yard.

The King No. 6 Mine, located in South Fork Canyon, was developed following the enactment of SMCRA. In 1981 the old portals from the King 3 Mine were updated and the King 6 haulage portal was developed. One intake airway portal was developed in the North Fork Drainage in 1979. The portals of the King No. 4 and King No. 5 Mines were backfilled in 1993.

Table II-2. Hiawatha Mine Extracted Coal	
Location/Mine Name	**Time Period/ Coal Seams Mined**
South of Hiawatha/ Old Blackhawk Mine-King No. 1	Pre-SMCRA / Hiawatha, A & B
Cedar Creek Canyon (Mohrland)/ Mohrland Mine, King No. 2, Castle Valley Coal Co. No.1	Pre-SMCRA / Hiawatha
South Fork Miller Creek / King No. 3.	Pre-SMCRA / Hiawatha
Middle Fork Miller Creek / Hiawatha No. 1 & 2, Consolidation Fuel Co. No. 1 & 2.	Pre-SMCRA 1909 - 1928 / Hiawatha
Middle Fork Miller Creek / King No 4. (Portals sealed 1993)	1974-4/1993 4/1991- 4/1993 (low production period) / A and B seams
Middle Fork Miller Creek / King No 5. (Portals sealed 1993)	1978 - 1983 / B seam (To be re-opened for future mining estimated to be initiated in 2000)
South Fork Miller Creek / King No. 6. (includes King No. 3 Portals)	1981-12/1988/ Hiawatha Seam

The Hiawatha processing plant was built in 1938. Slurry was discharged from the plant to slurry ponds and then sold. Waste rock and refuse was stored in three slurry impoundments and two refuse piles.

The Hiawatha permit area spans a total of 12,707 acres with 290 acres of disturbed area. U.S. Fuel ceased production April, 1993. Total production was greater than 50 million tons from more than 80 years of mining. The Hiawatha Mines Complex is now operated by the Hiawatha Coal Company, Inc.

Trail Canyon Mine(Co-Op Mining Company)

The Trail Canyon Mine is a reclaimed underground mine located in Trail Canyon, tributary to Huntington Creek (Map 3). This mine operated intermittently beginning in 1921. The mine was operated by Co-Op Mining Company through 1981. The permit area was approximately 270 acres with 10 acres of disturbed area. Reclamation activities began in June 1987 and most of the site grading and seeding was done in 1988 and 1989, but additional seeding was done as late as 1997. The Trail Canyon Mine obtained Phase I Bond release in July 18, 1994 and Phase II Bond release in January 31, 1996. Phase III Bond release was obtained in January 2001.

Deer Creek Waste Rock Storage Facility (PacifiCorp)

The Deer Creek Waste Rock Storage Facility encompasses 46.22 acres and is approximately 2 miles northeast of the Deer Creek Mine (Map 6). The expected life of the facility is 40 years. This site was predicted to receive 31,200 cubic yards of waste material annually. Utah Power and Light Company is the land owner within the Waste Rock Facility area.

III. HYDROLOGIC SYSTEM

The climate and geology, which affect the hydrologic characteristics, are described under specific headings and are followed by sections that discuss the ground-water and surface-water resources.

CLIMATE

Precipitation stations surrounding the CIA include the Bear Canyon Mine, East Mountain, Skyline Mine, and the town of Hiawatha. Climatic variations at these sites are influenced by elevation and aspect. The Bear Canyon Mine lies at an elevation of approximately 7,400 feet, while the town of Hiawatha lies at an elevation of 7,200 feet. The elevation across the CIA ranges from 6,300 feet in Huntington Creek to 9,850 feet on Gentry Mountain.

The climate of the CIA is semiarid, but precipitation increases with altitude. The average annual precipitation in the CIA may vary between 10 inches in the valley to over 30 inches on the ridges in the form of snow and rain. In the Wasatch Plateau, about 70 percent of the precipitation falls during October through April, mostly as snow. Summer thunderstorms and rain showers occur in the mountains and high valleys, but the towns and cities in the valleys may remain dry. Summer thunderstorms are generally localized, high-intensity, short-duration events. The 100-yr 24-hour precipitation event, with a probability of occurrence in any year of 0.01, would vary from 2.8 to 3.4 inches for May through October within the CIA (Miller, 1973). To illustrate the variation in recorded precipitation, selected data from the Bear Canyon and Trail Canyon Mine rain gages are presented in Table III-1. The difference in the maximum annual and minimum annual precipitation is considerable for the Bear Canyon and Trail Canyon drainages, which are slightly over a mile apart. The Nation Resource Conservation Service (NRCS) has two precipitation stations at higher elevations west of the Bear Canyon Mine: from 1961 to 1990 (NRCS, 1994), average annual precipitation was 29 inches at the Mammoth-Cottonwood station (elevation 8,800 feet) and 33 inches at Red Pine Ridge (elevation 9,200 feet).

Table III-1. Recorded Precipitation Data

Mine	Monthly Precipitation (inches)		Annual Precipitation (inches)		
	Max	Min	Max	Min	Avg
Bear Canyon(1993-1996)	3.87 (8/95)	0.07 (6/94)	14.37 (1995)	7.9 (1994)	10.0
Trail Canyon (1993-1996)	5.01 (8/95)	0.15 (6/93)	22.54 (1995)	11.23 (1993)	14.8

The evaporation and infiltration rates in the CIA vary according to vegetation, soil type, and time of year. The potential evaporation for Bear Canyon Mine is about 40 inches/year while transpiration is less than 18 inches/year. The relative humidity ranges from 45 percent in the summer to 85 percent in the winter. (Bear Canyon Mine Plan).

The CIA is predominately within the Palmer Hydrologic Drought Index (PHDI) Region 5. This index characterizes dry and moist climate periods for a region. It indicates the severity of a wet or dry spell, with negative values denoting a dry spell, and positive values denoting a wet spell. Because the CIA lies within the southern portion of Region 5, the climate may be influenced by the moisture regime from Regions 4 and 7 depending on the predominate storm direction and storm characteristics.

Temperatures are seasonally variable and generally cooler at higher elevations. January mean temperatures vary from a mean minimum of 8 to 12°F to a mean maximum of 28 to 32°F. July temperatures vary from a mean minimum of 40 to 52°F to a mean maximum of 72 to 84 °F. The average annual temperature is 45°F (Jeppson and others, 1968).

GEOLOGY

GENERAL

Geology described in this section focuses on elements needed to understand the hydrogeology: stratigraphy, general lithology, structure, and geologic factors determining ground-water occurrence.

The principal geologic controls that affect the presence of ground water in the Gentry Mountain area are: extensional or boundary faults and grabens, local faults and fissures, aquitards such as clay or Mancos Shale, channel sandstones, and structural dip. Each are discussed below.

STRATIGRAPHY AND GENERAL LITHOLOGY

Lithology of the Wasatch Plateau consists of Upper Cretaceous and Tertiary strata. Transgressive and regressive phases deposited a number of broad delta and prodelta sheet sandstones along a north-south trending interior seaway. The major coal deposits in Utah were formed along seaway shorelines and are planar and continuous. Landward influences such as small channel splays and levee deposits have created splits in the coal. Tidal inlet deltas, lagoonal muds, and washover fans produce rolls or undulations in the coal formation, fluvial channel scour, and discontinuous lenticular geology.

In ascending order by age, the strata exposed in the CIA (Map 5) are the Masuk Shale Member of the Mancos Shale, the coal bearing Blackhawk Formation, the Castlegate Sandstone, the Price River Formation, the North Horn Formation, the Flagstaff Formation and Quaternary Alluvium. Additional information for these formations can be found in the mining and reclamation plans and other geologic references. The Blackhawk Formation and Star Point Sandstone are described in more detail because of their importance to coal mining and hydrology in the CIA.

Blackhawk Formation and Star Point Sandstone

The Star Point Sandstone consists of several sheet sandstones that were deposited along the shores and deltas of a north-south trending interior seaway. In the vicinity of the CIA, the Star Point

Sandstone is comprised of, in ascending order, the Panther, Storrs, and Spring Canyon Sandstone Members. These members inter-tongue with the underlying marine Mancos Shale. The sandstones are usually gradational and sorted, medium-grained and cross-bedded at the top and fine-grained to silty at their base. They thicken westward and in places, such as near the central part of Huntington Canyon where they are more than 600 feet thick (Spieker, 1931), they merge into one massive sandstone unit. Farther west they grade into the back-barrier, coastal plain, and deltaic deposits of the Blackhawk Formation.

The Blackhawk Formation overlies the Star Point Sandstone. This formation is roughly 900 to 1,400 feet thick. It is the primary coal-bearing formation in the Book Cliffs and Wasatch Plateau Coal Fields, with minable coal seams in the lower 400 feet (Doelling, 1972).

The Aberdeen, Kenilworth, and Sunnyside are sandstone members of the lower Blackhawk Formation and are similar to the sandstone members of the Star Point Sandstone. They are interbedded with coals, shales, and siltstones in the Blackhawk Formation and inter-tongue with the Mancos Shale on the seaway side.

Sandstones in the lower Blackhawk are dominantly sheet deposits, but there are also lenticular channel sandstones that were deposited by fluvial systems. In the upper Blackhawk Formation, sheet sandstones are thinner and less common, but channel deposits are more abundant and are the dominant sandstone bodies. The fluvial channel sandstones are generally fine grained and well cemented. Localized zones of high clay content occur within the channel sandstones. These sinuous channel deposits may be interconnected, but in cross-section or outcrop they appear laterally discontinuous and hydrologically they act as local, perched aquifers rather than as regional aquifers.

The Hiawatha Seam is the lowest mineable coal seam of the Blackhawk Formation. It lies just above, and in places directly on, the Spring Canyon Sandstone. The names and general thicknesses of the mined coal horizons at the various mines in descending order are:

Star Point Mine (Star Point Mine Plan)

Tank	0 - 7 feet thick uneconomical for development
Wattis	2 - 12 feet thick 20 to 90 feet above Third
Third	3 - 13 feet thick 30 to 80 feet above Hiawatha
Hiawatha	1 - 11 feet thick.

Hiawatha Mine (Mine Plan Information Sheet)

Upper Seam	< 6 feet thick; 300 feet above the B Seam.
B seam	4- 12 feet thick; 0 -70 feet above A seam
A seam	0-12 feet thick; lies 0-60 feet above the Hiawatha
Hiawatha	up to 24 feet thick

Trail Canyon Mine (Limited information in MRP)

Upper Seam	No information
Hiawatha	Mined by Community Mine and other predecessors of Trail Canyon Mine in Trail Canyon - no information.

Bear Canyon Mine (Jahan Bani; and Mine Plan Information Sheet)

Tank	8 to 10 feet thick 0 to 8 feet thick and has 0 to 1600 ft over burden*
Blind Canyon	12 to 20 feet thick 30 to 80 feet above the Hiawatha 0-14 feet thick and 0 to 1800 ft over burden*
Hiawatha	5 to 9 feet thick; 0 to 8 feet thick and 0 to 1900 feet over burden*

Aquitards such as Clay or Mancos Shale

The presence of numerous springs in the headwaters of the CIA (Map 6) is a result of impermeable layers within the Blackhawk and overlying formations. Except where fractures are actually opened by tension, shales and siltstones in the formations hinder the vertical movement of ground water. These aquitards contribute to the formation of perched aquifer systems and also limit vertical migration between the sandstone tongues of the Star Point Sandstone (Bear Canyon Mine Plan).

Channel Sandstones

Channel sandstones may be isolated and localized or may be interconnected. They are commonly enveloped in finer grained sediments in strata overlying the coal seams, but also are found in the roof of the coal seams or even within the coal seams, as at Bear Canyon Mine. They are a common source of water in the mines. Typically, when water is entering a mine from the surrounding rock, drilling roof-bolt holes into overlying channel sandstones will increase the inflow. Such roof-bolt holes flow until the overlying sandstones are de-watered, usually only a short period of time.

One large channel sandstone in the Blind Canyon Seam has been the major source of water at the Bear Canyon Mine. This channel sandstone traverses east and west across the north end of the Blind Canyon Seam in the No. 1 Mine. Drips from the roof of the mine increased as mining approached this channel-sandstone unit. Initial flows from this channel sandstone were 120 gpm (Figure 6). Flow rose to over 400 gpm in 1992, then decreased to less than 100 gpm by the time the nearest monitoring point, SBC-9, was abandoned in 1999. Flow monitored at SBC-13 is believed to originate at the Blind Canyon channel sandstone and flow through gob to the monitoring point: flow at SBC-13 appears to be increasing.

STRUCTURE

Five significant fault zones trend north and south within the CIA; 1) the Pleasant Valley Fault, 2) the Trail Canyon Fault (East Fault of the Pleasant Valley Graben), 3) the Dry Canyon Fault, 4) the Blind Canyon Fault, and 5) the Bear Canyon Fault (Map 5). Normal faults are almost exclusively north-south trending and are associated with Basin and Range grabens. The grabens influence the local and regional hydrology. Fault displacements range from several feet to approximately 800 feet along the north south fault zones. Other features such as large amplitude folds do not occur on the Wasatch Plateau, but regional dip is modified locally by the tilt and rotation of individual fault blocks. More detail is presented for the Pleasant Valley and Bear Canyon Grabens, which are significant features in the CIA; joints and non-normal faults are then discussed.

Pleasant Valley Graben

The Pleasant Valley Graben extends from Scofield Reservoir south to Huntington Canyon and displaces strata as much as 400 feet near the Star Point Mine. The Pleasant Valley Fault appears continuous from Scofield Reservoir to the Tie Fork drainage. The eastern boundary of the Pleasant Valley Graben lies near the western edge of the Star Point Mine, where at least seven small faults have been mapped as the east boundary fault complex. Within the Star Point Mine area, this zone was considered highly fractured (Star Point Mine Plan).

The seven small faults of the east boundary fault complex are en-echelon, to the west, near the southwest corner in the NE 1/4 of Section 15 in T. 15 S., R. 7 E. (Star Point Mine Plan). These normal faults generally increase in throw east to west through a 1,000 to 1,200-foot-wide zone (the total width of this eastern fault complex was undetermined). The eastern most fault of the Pleasant Valley Graben along the Castle Valley Ridge is offset at least 45 feet and may increase in offset to the north. The offset of the remaining faults may exceed 70-100 feet, and the dip varies with depth from 65° W to 84° W, with an average of 80° W - 85° W (Star Point Mine Plan).

Bear Canyon Graben

The Bear Canyon Graben forms an irregularly inclined and irregularly bounded trough extending from south of Huntington Canyon, where it merges with the Pleasant Valley Graben, northward to First Water Canyon. This graben trends N 4° W, and ranges in width from 1,600 feet to 2,400 feet between major boundary faults (Star Point Mine Plan).

A great deal of information was collected on the Bear Canyon Graben when developing the Graben Tunnels in the Star Point Mine (Map 3). These rock tunnels across the Bear Canyon Graben connect the Wattis Seam east of the Bear Canyon Fault to the Wattis Seam in the Gentry Ridge Horst. Displacements across the eastern and western most faults averaged 250 feet. Fault gouge zones on the Bear Canyon Graben side (east) of the boundary faults were about 10 - 20 feet wide and appeared impermeable. Parallel to each major boundary fault within the Gentry Ridge Horst there are two fault zones approximately 200 to 250 feet in width. These zones consist of numerous offsets ranging from less than 1 foot to over 30 feet. Midway between the two boundary faults is another minor fault zone approximately 200 feet in width. Four faults were mapped in this zone with displacements ranging from 1 to 9 feet. Water seepage noted along the faults in this zone were 5 - 10 gpm (Star Point Mine Plan).

Joints and Non-normal Faults

Two types of regional stresses occurred in the CIA, resulting in several joint sets. One stress was compressional and the other was extensional (Star Point Mine Plan). Three orientations of joint sets resulted from each regional stress.

The joints formed during compressional stress are oriented N 58° E, N 58° W, and N 85° W. The N 58° E and N 58° W orientations are vertical, generally planar, and closed with a tendency to terminate over short distances or at lithologic boundaries. Carbonate and pyritic mineralization is common along these joint faces. The N 85° W joints are parallel to the maximum compressive stress. These joints lie along the N 85° W trending faults near the en-echelon and N 80° W faults (Star Point Mine Plan).

The joints formed during extensional stress orient N 5° W, N 6° E, and N 14° E. The N 6° E joints are more prominent and open. Due to the open nature of this joint set, ground- and surface-water migration and concentration is common along fracture systems having this orientation (Star Point Mine Plan).

A system of joint and fracture sets oriented N 15° E to N 17° E and a second set of minor joints with orientations N 60° E are found in the southern end of the Bear Canyon Graben, near the Bear Canyon Mine (Transcripts of Informal Conference, February 28, 1997).

Two non- normal N 80° W trending faults were encountered in the Star Point No. 2 Mine. Both were filled with biotite-rich intrusive rock at several locations. Displacement along these fault trends range from 0 to 5 feet within the Star Point Mine.

Extensional or Boundary Faults and Grabens

Boundary faults and interior faults of grabens generally form hydrologic boundaries impeding the movement of ground water across the faults. A boundary fault is commonly associated with gouge (pulverized clay-like material formed by the grinding of rock as the fault develops) and a highly fractured breccia zone (angular fragments from the fault movement): the amount of gouge and breccia is generally proportional to the amount of movement of the fault. Gouge can impede ground-water flow across or along the fault zone and cement the breccia. Fault gouge along the Blind Canyon Fault within the Bear Canyon Mine, in the south eastern zone of the Bear Canyon Graben, was observed to be dry. (Transcripts of Informal Conference, February 28, 1997). Gouge and breccia zones were excavated in the Bear Canyon Graben at the Star Point Mine, where breccia zones occur on one, and often both sides of the gouge (Star Point Mine Plan).

Significant ground water was intercepted by the Star Point Mine at two locations along the eastern boundary fault of the Bear Canyon Graben. At one location, flows were approximately 150 gpm when mining initially intercepted the fault zone and penetrated 40 to 60 feet of gouge and fractured rock, but decreased to no discharge after time. At the Hiawatha Mine, a sustained inflow of 900 to 1,000 gpm occurred where the workings contacted the Bear Canyon Fault in the 10th West Section of the U.S. Fuels King IV Mine (Star Point Mine Plan). Most faults from the extensional

system encountered in the Star Point No. 2 Mine had accompanying inflows of ground water where ground water was trapped against a gouge zone and was conducted along the breccia zone of the fault (Star Point Mine Plan).

Water may be conveyed along a fault until, 1) water discharges as a spring, 2) water discharges to a lower perched aquifer system, or 3) water discharges to the regional[1] ground-water system. The higher yielding springs appear to be associated with the north-south extensional fault or joint systems found in the area (Star Point Mine Plan). Most springs having flows in excess of 10 gpm lie either: 1) directly along a fault, 2) in close proximity to a fault, or 3) appear to fall in line with the projection of an identified fault.

Local Faults and Fissures

Local faults and fissures also influence ground-water movement. Parallel to the major boundary faults - the Bear Canyon Fault and the Trail Mountain Fault (East Fault of the Pleasant Valley Graben) - and extending inward are two fault zones approximately 200 to 250 feet in width (Map 3). Spring flows in these zones appear to respond quickly to snowmelt and recharge conditions, indicating the vertical permeability from fractures in the region is relatively significant (Star Point Mine Plan). Water seepage of from 1 - 20 gpm was observed to travel along these fractures depending on the gouge or breaking character of the fault (Star Point Mine Plan).

It has been hypothesized that at least part of the recharge for Big Bear Spring is conveyed from Big Bear Creek by way of local fractures.

Fault zones associated with boundary and interior faults may conduct ground water parallel to the faults. The Star Point Mine Plan (pages 700-6 and 700-7) states the following:

1. " The secondary permeability resulting from open fractures created along faults and joints provides the primary conduit system for ground-water movement within the Wasatch Plateau" .

2. " .. the extensional joints and faults that strike in a north-south direction are generally open, and as such increase the secondary permeability. .... The open nature of these joints and faults and the attendant secondary permeability may be primarily limited to the sandstone units within these formations".

3. " Secondary permeability within the grabens is expected to be greater than secondary permeability outside of the grabens. Joint densities within the Bear Canyon Graben are approximately 50 percent greater than joint densities on either side of the graben".

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[1] In this document the term "regional" is used for those water-bearing strata that may provide recharge to water resources considered to be significant in the CIA. The term is referred to in the Star Point Mine Plan and by Waddell and others (1986) to describe the Star Point/Blackhawk aquifer.

Dip of the Strata

Strata in the eastern Wasatch Plateau have a regional dip of 1 to 3 degrees, generally to the south. Dip angles increase near faults to about 20 degrees (Bear Canyon Mine Plan). The dip of the strata is a major factor governing local and regional ground-water flow directions.

In the Gentry Ridge Horst (between the Bear Canyon and Pleasant Valley Grabens), the coal seams in the Star Point Mine dip approximately 3 degrees to the south-southwest, and the dip and the general direction of ground-water movement in the perched aquifer system of the Price River - North Horn Formations is to the southwest. North of Tie Fork, a component of recharge within the Gentry Ridge Horst is from the north and discharges to Tie Fork. South of Tie Fork, dip in the Bear Canyon Graben is southeast and flow moves toward the Bear Canyon Fault.

East of the Bear Canyon Fault, dip within the mined areas and direction of ground-water movement are to the east and southeast. Localized variations within the coal seams may determine the ultimate direction of water flow following mining.

The August 1988 Earthquake

According to CPMC personnel and the University of Utah Seismology Department (Nava and others, 1990), the area experienced several earthquakes during the fall of 1988. Information including dates and earthquake magnitude for the four largest earthquakes identified during this period (centered approximately 15 miles east of Ferron, Utah and 29 miles southeast of the Tie Fork wells) as provided by the University of Utah include:

Date	Time	Magnitude
August 14, 1988	1:07 p.m.	3.8
August 14, 1988	2:03 p.m.	5.3
August 15, 1988	8:50 a.m.	3.0
August 18, 1988	6:57 p.m.	4.4

A flow increase recorded at Upper Tie Fork Spring in August 1988 correlates with the August 14, 1988 earthquake. This is discussed further in several sections of this CHIA.

HYDROLOGIC RESOURCES

Surface- and ground-water resources within the CIA are described. Water rights associated with some of the more important resources are presented, along with descriptions of their hydrology and geology.

GROUND WATER

Ground-water Rights

Ground water within and adjacent to the CIA is used for wildlife, stock watering, domestic, industrial, and municipal purposes. Water rights are presented by association with a source such as a well or a spring, and then they are presented for the associated mines.

Water Rights Associated with Wells

The ground-water resources for well development are limited in the CIA. One well source, Water Right E1621, owned by Utah Power and Light, was identified within the Bear Canyon Mine Plan adjacent area. Adjacent to the Star Point Mine, three wells in the Tie Fork drainage were developed as a result of drilling into a pressurized aquifer, which created artesian flow (85-35-1 was an exploratory hole deeded to Huntington City to supplement flow being developed by the city at flowing wells 86-35-2 and 86-35-3: flows from 86-35-2 and 86-35-3 are usually combined and reported as 86-35-2-3). The three Tie Fork wells are referred to as Upper Tie Fork Spring and are discussed below.

Rights associated with Springs

Stock watering is the predominate water-right use associated with springs on Gentry Ridge; these spring sources are also used by wildlife. Many springs in the Gentry and Hoag Ridge area have water rights allocated to the Forest Service.

Of the 88 ground-water rights listed in Table 724.100e the Star Point Mine Plan, 87 are for springs, one for an in-mine well. Only eight have uses listed as "domestic" or "other". Of these eight rights, CPMC (or Getty Oil Co.) owns five: 91-59 and 91-57 are associated with springs in Sagebrush Canyon, 92-9295 is a spring on Gentry Ridge, 91-61 is for spring S17-2, and in-mine well right 91-3555 is used to supply water for the Star Point Mine office. As for the three other "domestic" or "other" water rights, 91-103 and 91-104 are held by U. S. Fuel in the headwaters of the Middle and Left Fork of Miller Creek., and 93-219 is held by Huntington-Cleveland Irrigation for Tie Fork Springs (wells 85-35-1 and 86-35-2-3 - Maps 3 and 5). This right was segregated from surface-water right 93-3709 on Huntington Creek by change application number a7941. The right allocates 150 cfs of water use to a 62 acre feet/year maximum.

Appendix 7-C of the Bear Canyon Mine Plan identified 35 water rights associated with 15 springs: 12 are for stockwatering, 17 are for domestic and municipal uses, and the remainder are for irrigation or other uses. There are also 4 in-mine water rights listed in Appendix 7-C, with various uses including mining, domestic, and irrigation. Discussions on the potential for impact to these sources is presented in following sections of this CHIA.

Birch and Big Bear Springs have a number of associated water rights. These rights are summarized and presented in Table III-2. One water right associated with Birch Spring, owned by Nevada Electric Corporation, has a designated stockwatering use for 30 head of cattle at the spring source. This use is incompatible with the domestic use; however, the area around the spring is

fenced and has not been grazed for many years. Big Bear Spring, also called Bear Canyon Spring, is referenced as Big Bear Spring in this document because it is the name associated with this water right.

Table III-2: Selected Water Rights Information [1]

Source	Water Right Number	Quantity	Priority	Owner
Birch Spring	93-304	150 cfs	1875	Huntington-Cleveland Irrigation Co.
	93-2198	80 cfs	1875	Huntington-Cleveland Irrigation Co.
	93-2197	77.25 cfs	1884	Huntington-Cleveland Irrigation Co.
	93-2196	45 cfs	1879	Huntington-Cleveland Irrigation Co.
	E2504 93 3703	0.00 cfs (see the following paragraph)	1887	Castle Valley Special Service District
	93-143	0.011 cfs	1875	Nevada Electric
Big Bear Spring	93-2201	80 cfs	1888	Huntington-Cleveland Irrigation Co.
	93-2200	77.25 cfs	1884	Huntington-Cleveland Irrigation Co.
	93-2199	45.0 cfs	1879	Huntington-Cleveland Irrigation Co.
	93-253	150 cfs	1875	Huntington-Cleveland Irrigation Co.
Tie Fork Springs (Wells)	93-219	150 cfs 162 AF	1875	Huntington-Cleveland Irrigation Co.
	93-2220	45 cfs	1879	Huntington-Cleveland Irrigation Co.
	93-2221	77.25 cfs	1884	Huntington-Cleveland Irrigation Co.
	93-2222	80 cfs	1888	Huntington-Cleveland Irrigation Co.

1 - Information was obtained through the State of Utah Water Rights Internet site. Because they make no claims to accuracy for the information at their site, the information needs additional confirmation.

The Tie Fork, Birch, and Big Bear Springs are within the North Emery Water Users Association (NEWUA) service area and are controlled by the Huntington Cleveland Irrigation Company for domestic and municipal uses. The domestic use is for 650 families. These uses are granted under the H.H. Christensen Decree. Water right E2504 is an exchanged right, from right 93-3703, that gives the Castle Valley Special Service District (CVSSD) the right to deliver water to the cities of Huntington (500 AF), Cleveland (114 AF) and Elmo (67 AF). The total quantity of water right use granted to the Huntington-Cleveland Irrigation Company is 392.5 cfs from the various spring and surface-water resources in Huntington Canyon.

Rights Associated with the Mines and Mine Water

Star Point Mine

Water right 91-3555 is held by CPMC for an in-mine well. Water is pumped to the surface to provide a domestic water supply for the office facilities.

Hiawatha Coal Mine

The main water resources associated with the Hiawatha mine are the mine-water discharge points themselves. Co-Op has rights to some springs in the area south of Hiawatha, and the ANR

Co holds water right 91-174 (application a4656) that allocates a diversion of 3.3 cfs from the Left Fork of Miller Creek for domestic and mining uses.

Table III-3: Hiawatha Mine Water Rights

Source	Right Number	Quantity	Priority	Owner/Use
King #1 Tunnel	91-251 a29532	0.942 cfs	1875	ANR Co. Inc. /Industrial &Municipal
	91-316 a6963	0.058 cfs	1989	ANR Co. Inc. /Industrial &Municipal
Mohrland Mine Seeps and Drains	93-1089	0.446 cfs	1884	United States Fuel Corporation/ Irrigation

Bear Canyon and Trail Canyon Mine

Water right application a15965 is controlled by the Co-Op Mining Company for diversion from a spring and mine portal. The quantity of use is for 150 cfs, or a total of 62 AF. Diversions are located in Sections 22 and Sections 24 of T. 16S, R. 7E. One diversion is associated with the Trail Canyon Mine and the other is associated with the Bear Canyon Mine Portal.

One water right and one water right application are listed with the Kingston family, who are tied with the corporate structure of the Co-Op mine. Water right 93-1067 allocates 0.25 cfs for irrigation and mining. This right has a 1985 priority date. Water right application a13694 grants water to be diverted from the Bear Canyon Tunnel at a rate of 0.25 cfs, and is used to fill the two 10,000 gallon tanks near the mine. This right has multiple uses: irrigation, domestic, mine shower facilities, and other uses. It has a 1985 priority date.

Ground-water Quantity and Quality

Ground-water Recharge

Ground-water recharge is controlled by climatologic factors and the physical factors that allow the transport of water. Water must be available in excess of soil, plant uptake and evaporation losses in order to contribute to recharge. Moist climatic periods allow the rate of water transport to reach its potential. Snowmelt at higher elevations provides the majority of recharge to ground-water in this region. Streams and reservoirs may also contribute to recharge but the extent of this recharge is unknown.

Recharge in the Wasatch Plateau and Book Cliffs coal fields has been estimated to be three to eight percent (Danielson and Sylla, 1983) and nine percent (Waddell and others, 1986) of the average annual precipitation. Snowmelt provides most of the ground-water recharge. An estimated four percent of the total annual precipitation recharging the local ground-water systems in the Star Point Mine permit area. This was determined by making the assumption that long - term recharge equals long-term ground-water discharge. Calculations can be found in the Star Point Mine Plan .

Recharge to the perched aquifer system of the Price River and North Horn Formations is primarily from snowmelt along the flatter areas of Gentry and Hoag Ridge, and from snowpack that accumulates in surface watersheds (Map 6). These areas provide greater opportunity for water infiltration from melting snow. The normal annual precipitation for the higher elevations is 16 to 30 inches, of which 10 to 25 inches normally falls during October through April (Jeppson and others, 1968). Snowpack at these higher elevations commonly accumulate to depths of ten feet or more. The majority of fault related springs, which issue from the perched aquifer system of the Price River and North Horn Formations, appear to provide limited recharge to the regional aquifers Star Point Mine Plan. Lower in the stratigraphic column, recharge is limited by shale or mudstone aquitards. Recharge to lower systems can occur along open fault planes, at contacts with water bearing formations, or from surface-water seepage down the fault plane.

Once recharge enters the ground, the rate and direction of ground-water flow is governed mainly by gravity and geology. Lateral ground-water flow dominates in the gently-dipping Tertiary and Cretaceous strata of the Wasatch Plateau, where layers of low-permeability rock that impede downward movement are common. Both lateral and vertical flow may be channeled through open faults and fractures or fractured breccia zones, but plastic or swelling clays that can seal faults and fractures are abundant. Typically ground-water recharged at higher elevations in the Wasatch Plateau flows both laterally and downward until it intercepts the surface and is discharged as a spring or seep, enters a stream as baseflow, is transpired by vegetation, or simply evaporates. Ground water tends to flow more readily through shallower systems because the hydraulic conductivities are generally larger than those of deeper systems, but some of the ground water will flow along deeper, slower flow-paths.

The hydraulic flow path of ground water along joints, fractures, and faults is extremely complex, and the volume or rate of recharge down a fault is difficult to quantify (Star Point 1996 Permit Renewal). Springs in the region that are associated with faults have a quick recharge response. This response time suggests the fault zones receive a greater localized recharge rate than the region.

Aquifers

The two major aquifers within the CIA are the Star Point Sandstone and the combined North Horn and Price River Formations. These aquifers are modified by north-south normal faults systems that can act as boundaries or conduits, and sometimes act simultaneously as barriers to flow across the fracture but as conduits for flow parallel to the fracture. North-south normal faults structurally control local hydrologic regimens. Dip of the strata also controls flow direction: west of the Bear Canyon Graben, strata dip to the south-southwest, and east of the Bear Canyon Graben, dip is south-southeast.

Work done for a previous CHIA (Gentry Mountain CIA, Revised March, 1994) included an estimate that over 325 seeps and springs occur within the CIA, with a total discharge in excess of 1,500 gpm: 189 springs discharging from the North Horn and Price River Formations (1,200 gpm), 37 springs discharging from the Castlegate Formation (80 gpm), 53 springs discharging from the Black Hawk Formation and Star Point Sandstone (200 gpm), and 8 springs discharging from the Mancos Shale (40 gpm).

The North Horn - Price River Formations

In the CIA area, the most significant perched aquifer systems occur near the ridge top in the Price River and North Horn Formations. The majority of high elevation springs are located near Gentry Mountain Ridge above the Star Point Mine.

Two hundred and four springs were inventoried for the Star Point Mine permit and adjacent area in 1986 and 1991. More than 75 percent of the springs issue from the Price River and North Horn Formations. An additional 25 springs were found that issue from the Castlegate Sandstone. These formations represent 88 percent of all springs CPMC inventoried. Several springs that issue from the southern and western region along Gentry Ridge issue at shale-sandstone interfaces and are believed to be non-fault related. Aquifer storage and discharge characteristics from the Price River and North Horn Formation perched aquifer systems drop off significantly from early summer to late fall (Star Point Mine Plan).

Springs were found at various elevations along faults within the upper Price River and North Horn. In bore-hole 84-23-1, wet strata were identified at depths of 130 feet to 190 feet (elevations of 9,698 and 9,638 ft above msl, respectively), and the 190-foot depth correlates with a sandstone-shale interface and numerous springs. Monitoring well 86-26-4 located a water table along Gentry Ridge in a perched system at an approximate elevation of 9,550 feet (Star Point Mine Plan).

The general direction of ground-water movement is to the southwest in the perched aquifer systems of the Price River and North Horn Formations within the Gentry Ridge Horst, between Bear Canyon and Pleasant Valley Grabens. Few springs issue from this formation below McCadden Hollow (Map 6). Only a few low volume springs occur to the north of the Bear Canyon permit area and three springs were found within the permit area (Bear Canyon Mine Plan).

The Star Point-Blackhawk Aquifers

The Star Point Sandstone consists of, from stratigraphically highest to lowest, the Spring Canyon, Storrs, and Panther Sandstone Members. The Spring Canyon Member is composed of fluvial shales siltstone and channel sandstones. Channel sandstones are woven throughout the formation and may appear somewhat discontinuous, but are associated with a large, ancient stream system. These channel sandstones may be linearly extensive except where they are dissected by faults.

Clay is abundant throughout the Blackhawk Formation, producing localized perched aquifers. The Blackhawk Formation overlies the Star Point Sandstone and, based on local characteristics, the Blackhawk and the Star Point may be in hydrologic connection.

According to the Star Point Mine Plan, the regional aquifer system occurs within the Blackhawk Formation in the Gentry Ridge Horst, between the Bear Canyon and Pleasant Valley Grabens. The dip of the Blackhawk strata is to the southwest and the coal in the Blackhawk Formation extends beneath where the stream in Tie Fork Canyon becomes perennial. The saturated zone of the regional aquifer extends up into the Blackhawk Formation within the southern portions of the Star Point Mine in the Gentry Ridge area (Star Point Mine Plan): according to the Star Point

Mine Plan, mining conducted in 1991 verified that water was present both within and above the Star Point Sandstone. Farther down gradient, in the Bear Canyon Mine, the Star Point Sandstone tongues have separate potentiometric surfaces, and that they are separate from that of the Blackhawk Formation (Bear Canyon Mine Plan).

Information from the mines in the CIA suggests water movement is lateral within the tongues and vertical movement through the tongues is minimal, therefore recharge to the Star Point must occur primarily from vertical fractures and outcrop locations. In places the recharge rate may be slow, or where highly fractured, as at Tie Fork Springs, recharge rates may be quick. Secondary permeability resulting from open fractures created along faults and joints was identified as the primary conduit system for ground-water movement within the Star Point Mine.

Information from the Hiawatha Mine Plan indicated that the degree of interconnection between the Bear Canyon Fault and the Star Point Sandstone below the mine workings is unknown.

Springs issue from the Blackhawk Formation and the Star Point Sandstone. Of the ten springs found issuing from the Blackhawk Formation in the Star Point Mine spring survey, five were found in Little Park Canyon on the west side of the permit area, three were found along or near the East Fault of the Pleasant Valley Graben in Wild Cattle Hollow near its junction with Gentry Hollow, one was found in Mud Water Canyon, and one was found in Seeley Canyon (some of these springs are shown on Map 6). One spring flow rate was 11 gpm while all other Blackhawk spring flow rates were 3 gpm or less (Star Point Mine Plan). The majority of springs in the Bear Canyon Mine area discharge from the Star Point Sandstone or colluvium adjacent to the sandstone. Two of the largest producing springs, Birch and Big Bear Springs, are associated with fault and joint systems and issue from the Panther Tongue.

Some water flows through the Blackhawk and issues from the Mancos Shale. The Star Point Mine identified seven springs that issue from the Mancos Shale. The two largest yielding springs, springs 102 and 103 in Seeley Canyon, issue from faults. Although a fault has not been identified that would extend through the location of the other five Mancos Shale related springs, it is likely that these springs are also fault or fracture related (Star Point Mine Plan).

According to Price and Arnow (1974), the upper Blackhawk Formation Cretaceous sediments have a low hydraulic conductivity and specific yields of 0.2 to 0.7 percent. Two pump tests from wells drilled into the Blackhawk Formation in Eccles Canyon, north of the CIA, produced transmissivities of 21 and 16.3 gallons per day per foot. The Blackhawk aquifers are generally laterally discontinuous perched aquifers and fluvial channel sandstones. The primary permeability within the Star Point Sandstone and overlying formations is quite low. Average linear ground-water flow velocities in the Star Point Sandstone had transmissivities from 1 to over 50 ft^2 /day (Bear Canyon Mine Plan, PHC).

General Ground-water Quality

The ground-water quality of the upper Cretaceous sediments in the Wasatch Plateau is characterized by total dissolved solids (TDS) concentrations less than 1,000 milligrams per liter (mg/L). The TDS measured in springs, wells, and mines issuing from or completed in the formations

are reported for the Wasatch Plateau and Book Cliffs areas by Waddell and others (1981) as:

- Price River Formation 122-792 mg/L
- Castlegate Formation 315-806 mg/L
- Blackhawk Formation 63-796 mg/L
- Star Point Sandstone 355-391 mg/L

The local characteristics are summarized below for each formation. The Mancos shale is also included because some springs were found issuing at the top of the formation.

Price River-North Horn Formations

This formation lies entirely above all mine workings. Water quality from this formation is adequately described through spring water-quality analyses because the formation has a quick response time to seasonal precipitation, and water is locally recharged and discharged at nearby springs. The Price River and North Horn Formations are similar, having the primary chemical constituents of calcium and bicarbonate. At certain locations, particularly along Gentry Ridge where the Flagstaff Formation also is present, magnesium becomes a more dominant cation than at the other locations (probably due to the solution of dolomite). The concentration of TDS is generally less than 300 mg/L. The mean concentration of TDS for springs, monitored by CPMC from 1979 to 1990, from the Price River and North Horn perched system varied from a low mean concentration of 124 mg/L to a high of 298 mg/L. In general, TDS concentrations are higher in the fall than in the early summer due to localized snowmelt and short residence time (Star Point Mine Plan).

Blackhawk Formation

Ground water from the Blackhawk Formation is a mixed type with no single dominant cation or anion. Springs from the Blackhawk Formation tend to be a calcium bicarbonate type, but waters from the Blackhawk can contain significant concentrations of magnesium and sulfate. Water quality can be better where springs issue from fractures and are recharged locally. TDS concentrations tend to vary inversely with flow. pH is generally somewhat alkaline. Within the mines, some waters from the Blackhawk may be old and may have higher concentrations of TDS, magnesium, and sulfate.

Star Point Sandstone

Ground water from the Star Point Sandstone is a mixed type with no single dominant cation or anion. Water quality can be better where springs issue from fractures and are recharged locally.

Mancos Shale

Sulfate concentrations may increase because of contact with shales having a high sulfide concentration.

SURFACE WATER

Surface waters from within the CHIA flow to both the Price River and San Rafael River Basins. These basins discharge to the Green River, which joins the Colorado River (Map 1).

The Price River Basin is located primarily within Carbon and Emery Counties and has an area of approximately 1,800 square miles. The Price River originates in the Wasatch Plateau, at the outlet of Scofield Reservoir. The river flows east-northeast from Scofield Reservoir and then turns and flows to the south-southeast. The Price River drainage basin is bounded by the Book Cliffs to the north- northeast and the Wasatch Plateau to the northwest, with the divide that extends from Gentry Ridge to Cedar Mountain forming the southern boundary within the Wasatch Plateau. Flow from the CIA enters the Price River south of Wellington, Utah (Map 1).

The San Rafael River Basin is located primarily in Emery County and lies south of the Price River Basin. This drainage basin covers approximately 2,300 square miles. The San Rafael River Basin drains sections of the Wasatch Plateau and the San Rafael Swell north of San Rafael Nob. Three major tributaries - Huntington, Cottonwood and Ferron Creeks - converge to form the San Rafael River. Huntington Creek is the primary surface-water resource in the San Rafael River Basin, draining the south-east portion of the CIA. The San Rafael River flows into the Green River (Map 1).

Surface-water Rights

Local water development in the region is primarily focused in the Huntington drainage. Water reservoirs were constructed in the Huntington Creek headwaters adjacent to the CIA, and the southwest regions of the CIA drain to Huntington Creek. The primary water users are North Emery Water Users Association (NEWUA) and the Huntington Cleveland Irrigation Company, which hold rights for domestic and municipal uses. The Castle Valley Special Service District (CVSSD) delivers water to the cities of Huntington (500 AF), Cleveland (114 AF) and Elmo (67 AF). The total quantity of use granted to the Huntington-Cleveland Irrigation Company is 392.5 cfs from the various spring and surface-water resources in Huntington Canyon. Other water rights associated with springs of the CIA may contribute to down stream surface-water rights.

Surface-water Quantity and Quality

Watersheds in the CIA

The CIA is contained within two major river basins, the San Rafael River Basin and the Price River Basin. Sub-basins, surface-water monitoring sites, and UPDES water monitoring sites are shown on Map 6. The sub-basins in the Price River Basin are Sand Wash (1), Miller Creek (2), Serviceberry Creek (3), Mud Water Canyon (4), and Corner Canyon (5). The sub-basins in the San Rafael River Basin are Nuck Woodward (6 and 7), Tie Fork Drainage (11, 9 and 10), Trail Creek Drainage (13), and Bear Creek Drainage (15), Fish Creek Drainage (16), and Cedar Creek Drainage (18), Miscellaneous Huntington Creek Tributaries (8, 12, and 17).

Price River Basin

Sand Wash Drainage (1) and Miller Creek Drainage (2)

Miller Creek (11,892 acres) and Sand Wash (6,082 acres) drain the south west portion of areas associated with the Hiawatha and Star Point Mines. Miller Creek has an average gradient of 15 percent and Sand Wash has an average gradient 17 percent. Flow in the North Fork of the Right Fork of Miller Creek is intermittent to perennial.

Approximately 350 disturbed acres from the Hiawatha Mine lie within the upper reaches of Sand Wash and the Right and Left Forks of Miller Creek. Miller Creek was permanently diverted along a reach adjacent to the coal processing waste pile. Hiawatha and Star Point Mines mined under Miller Creek. Cypress Plateau mined under the North Fork of the Right Fork of Miller Creek.

Of the 36 springs identified within the North Fork of the Right Fork of Miller Creek, 21 springs issue from the Price River - North Horn Formation, 14 springs issue from the Castlegate Sandstone, and one spring issues from the Star Point Sandstone. Total flow from these springs during a spring inventory conducted for the Star Point Mine was 99 gpm (0.22 cfs). This represented 86 percent of the 0.26 cfs flow from the North Fork of the Right Fork of Miller Creek.

Serviceberry Creek Drainage (3)

Serviceberry Creek drains 6,321 acres within the CIA and has a 21 percent gradient, on average. Serviceberry Creek is ephemeral and is tributary to Miller Creek, east of the CIA. The Star Point Mine disturbed area (approximately 330 acres) lies primarily within the Serviceberry Creek drainage, and mining has occurred under the upper reaches of this watershed.

Mud Water - Los Angles Canyons Drainage (4) and Corner Canyon Drainage (5)

Mud Water and Los Angeles Canyons (3,040 acres) have a 19 percent gradient on average. The Corner Canyon drainage (6,951 acres) includes Seely and First Water Canyons. Mud Water and Corner Canyon drainages converge to form Gordon Creek. The Gentry Mountain CHIA prepared in 1989 stated that Mud Water, Seeley, and the South Fork of Corner Canyon were perennial in their lower reaches due to high-elevation spring flows and mine-water discharge. Mining occurred in the headwaters and ridges separating these drainages.

San Rafael River Basin - Huntington Drainage

Flow in Huntington Creek is controlled by three reservoirs upstream of and outside of the CIA: Electric Lake and Huntington and Cleveland Reservoirs. Typically, a rapid increase in streamflow results from snowmelt between April and June. Climatic influences and water releases from the reservoirs control year-to-year variations.

The USGS monitored Huntington Creek at station 09318000 almost daily from 05/03/1909 to 10/04/1979 (U. S. Geological Survey NWIS): except that data for water-year 1918 are missing, there are only small gaps in the record. Mean daily discharge over this period averaged 106 cfs, with

a maximum of 1,310 cfs (06/06/1952) and a minimum of 1.2 cfs (12/17/1977). Extreme flows were 2,500 cfs on 8/2/30, and 0.87 cfs, which occurred twice - both during November - on 11/26/76 and 11/28/78 (Price and Plantz, 1987). On 04/25/1979, the USGS began monitoring Huntington Creek at 09317997, approximately 2 miles upstream of 09318000 and upstream of the Deer Creek confluence, and monitoring at this site continued until 09/30/1989 (U. S. Geological Survey NWIS): during this ten-year period mean daily discharge averaged 89 cfs, with a maximum and a minimum of 847 cfs and 8.1 cfs, respectively.

PacifiCorp measures the flow in lower Huntington Creek at two locations near the Deer Creek Mine, one just upstream and one just downstream of the Deer Creek confluence: HC001 is near USGS 09317997. The PacifiCorp data show that from 01/28/1991 to 9/5/2000, flow in Huntington Creek averaged 90 cfs, with a maximum of 490 cfs on 06/30/1995 and a minimum of 0 cfs (no flow) on 12/01/1993.

Nuck Woodward (6) and (7)

Nuck Woodward Canyon drains approximately 6,738 acres and is directly tributary to Huntington Creek. This drainage abuts the northwestern mined region of the Star Point Mine. The East Fault of the Pleasant Valley Graben appears to be a water source for the local hydrologic system of the Pleasant Valley Graben, which extends southwards from Nuck Woodward Canyon to the western portions of the Gentry Ridge Horst and to Tie Fork Canyon (Map 3).

Surface water in Nuck Woodward Canyon is believed to be connected to the ground water in the Star Point Mine. The Star Point Mine Plan submitted in 1996 states, "Water flowing down Nuck Woodward Canyon is believed to be partially lost to this [Eastern Boundary] fault system where after it joins with deeper water moving within the fault. Water is then directed underground towards and through the permit area." Extensive local faulting through the streambed and local ground-water recharge comes from the direction of Nuck Woodward Canyon (Star Point Mine Plan, p. 700-68). "It may also be possible for water to enter the fault in Nuck Woodward Canyon, move southward along the East Fault of the Pleasant Valley Graben, south-southeastward across Gentry Ridge toward the Western Boundary Fault of the Bear Canyon Graben, then southward towards Birch and Big Bear Springs. The complexity and additional length of the water flow path greatly reduces the potential for impact on both Birch and Big Bear Springs by mining" (p. 700-83).

A stream survey completed for the Star Point Mine in 1992 identified losing stream sections in Nuck Woodward canyon. The stream survey included the entire reach of Nuck Woodward canyon adjacent to the Star Point Mine. Measurements taken during the survey did not include inflow that may have originated from the side drainages except for 10 gpm noted at "First Canyon". Information found in Table 728 in the Star Point Mine Plan indicates a majority of the stream appears to be losing water. Significant reach decreases were as much as 33 gpm.(Star Point Mine Plan, p. 700-68).

Tie Fork Drainage (11, 9, 10)

Wild Cattle Hollow (2,759 acres) and Gentry Hollow (3,830 acres) join Lower Tie Fork Canyon (1,199 acres) to form the Tie Fork Drainage. The average gradient for Gentry and Wild

Cattle Hollow is 13 percent and the Lower Tie Fork Canyon gradient is 44 percent.

Wild Cattle Hollow was mined under within the Star Point Mine permit area, and Gentry Hollow was mined under within the Hiawatha Mine and the Star Point Mine permit areas. The Star Point Mine longwall panels abut Wild Cattle Hollow's main channel. Both Gentry Hollow and Wild Cattle Hollow are designated perennial creeks on the USGS Hiawatha quadrangle map.

Springs were monitored within the Star Point Mine area and adjacent area in June/July of 1986 and were monitored again in August 1991. All 51 springs found within the Gentry Hollow surface-water drainage basin issue from the North Horn Formation. Total discharge from these springs in 1990 was 418 gpm (0.93 cfs). If it is assumed that there are no stream losses between the springs and the junction of Gentry and Wild Cattle Hollows, total spring flow would represent 71 percent of the1.3 cfs total streamflow (Star Point Mine Plan).

From the 60 springs found within the surface-water drainage basin of Wild Cattle Hollow, 57 of the springs issue from the Price River - North Horn Formations. The three remaining minor springs issue from the Blackhawk Formation near the junction of Wild Cattle and Gentry Hollows. Total discharge from these 60 springs was 393 gpm (0.88 cfs), which represents 86 percent of the 1.02 cfs total streamflow measured in Wild Cattle Hollow (Star Point Mine Plan).

Discharge rates for Tie Fork Canyon are available for USGS station 09317920 from 10/20/1977 to 10/07/1981 (U. S. Geological Survey NWIS): data are missing for 02/28/1978 to 09/21/1978, 12/03/1979 to 04/29/1980, and 11/30/1980 to 05/01/1981. Measured mean daily discharge averaged 2.43 cfs. It ranged from 0 cfs (15 days between November 1977 and February 1978) to 29 cfs (five days in late May and early June 1980).

Huntington Creek Tributaries (8, 12, and 17)

Miscellaneous tributaries to Huntington Creek that originate within the CIA include: Pole Canyon, Mc Elprang Canyon, Vicks Canyon, Grange Hole, Biddlecome Hollow (8), Blind or Dry Canyon - which includes Birch Spring (14), and two miscellaneous side drainages (12) and (17). The 46.22 permitted acres associated with the Deer Creek Waste Rock site lie within Watershed Area 17 (Map 6). The average gradients of these tributaries ranges from 40 to 70 percent.

Trail Creek Drainage (13) and Bear Creek Drainage (15).

Trail Canyon drainage encompasses approximately 2,954 acres, including McCadden Hollow. Bear Canyon drainage includes approximately 2,029 acres. The average gradient of Trail and Bear Canyons is 20 to 25 percent.

Bear Creek lies below Gentry Ridge in steep, narrow canyons. It carries large sediment loads: Total Suspended Sediment (TSS) of 28, 092 mg/L was measured during a major storm event. Sediment sources are the exposed bedrock along the boundary of the Gentry Ridge escarpments and the springs that issue along the Bear Canyon Fault where erosive lithologic units are exposed. Trail Creek (9) is characterized by steep gradients, narrow canyons, and good water quality.

Approximately 10 surface acres have been disturbed in both the Bear Canyon and Trail Canyon drainages. Trail Canyon includes a residential area of about 14 acres that is not associated with the Trail Canyon Mine. The disturbed area associated with the Trail Canyon Mine is reclaimed and was released from the reclamation bond in January 2001.

Fish Creek Drainage (16) and Cedar Creek Drainage (18).

Fish Creek drainage encompasses approximately 5,288 acres, and the average gradient is 19 percent. Fish Creek is identified as a perennial stream in the Bear Canyon Mine PHC, but monitoring has been very sparse. These drainages have gone dry during periods of prolonged drought. From 1991 to 1994 flow ranged from 0 gpm to 65 gpm in the Left Fork; during 1996 and 1997 low flow was 15 gpm in both the Left and Right Forks.

Cedar Creek drainage covers approximately 17,023 acres. The average gradient is 13 percent. The Hiawatha Mine area lies within portions of the Right and Left Fork of Cedar Creek. The Mohrland Mine surface facilities and disturbed area (approximately 25 acres) are adjacent to Cedar Creek. Mine-water discharges consistently from the Mohrland Mine Portal. The Right Fork is ephemeral and the Left Fork exhibits perennial characteristics in certain reaches due to mine-water discharge.

General Surface-water Quality

The State Division of Water Quality has classified waters in the Price River and its tributaries, below the Price City Water Treatment Plant intake, as Class 2B, 3C and 4. Waters in the San Rafael-Huntington Creek drainage are classified as 1C, 2B, 3A, and 4. Classes 1C, 2B, 3A, 3C, and 4 designate domestic, secondary contact recreation, cold water aquatics, warm water aquatics, and agricultural uses, respectively (UDWQ, 1994).

Suspended sediment load is site specific. The suspended sediment concentrations varied in surface-water samples collected by the USGS (Danielsen and others, 1981) in Huntington and Cottonwood Canyons: data for three sites are included in Table III-5 below. The sample from Bear Canyon shows a high sediment concentration while Tie Fork is low relative to the other two sites presented: Danielsen and others attributed the high concentration in Bear Canyon to continuous erosion and sloughing of fine-grained sediments caused by the springs that emerge from the Blackhawk Formation in the headwaters. Suspended sediment concentrations generally increase as flows increase.

Table III-5: SUSPENDED SEDIMENT LOADS (Danielsen and others, 1981, p. 17)

Stream	Date	Concentration (mg/L)	Load (tons/day)
Huntington Creek (09318000)	8-13-78	104	27
	11-17-78	72	2.5
	6-13-79	114	66
	8-7-79	44	15
Tie Fork Canyon (09317920)	8-13-78	12	0.03
	11-17-78	57	0.12
	6-13-79	38	0.68
	8-6-79	66	0.17
Bear Creek	10-25-78	8,860	1.9
	6-14-79	2,140	4.0

IV. PROBABLE HYDROLOGIC IMPACTS

In this section potential impacts to ground water and surface water associated with mining are identified. Specific ground-water and surface-water resources within the CIA are identified and data are reviewed to determine potential impacts to the hydrologic balance. Probable impacts to the hydrologic balance are then determined.

GROUND-WATER RESOURCE HYDROLOGIC IMPACT ASSESSMENT

Ground-water quantity and quality may be affected by mining activities. Because of the semi-arid environment in Carbon and Emery Counties, potential changes in ground-water quantity seem to have been the focus of recent concern from the public. Changes in ground-water quality are discussed in conjunction with spring and surface-water uses (**SURFACE-WATER RESOURCE HYDROLOGIC IMPACT ASSESSMENT**) because ground-water use in the region is primarily tied to the associated surface discharge points.

Mining may alter ground-water flow direction, water storage, and transmissivity. Altered ground-water flow characteristics result from intercepting adjacent water sources, from water transfer across basins, and from changes in permeability and transmissivity in rock units above, below, and within the mined rock units. Transmissivity changes may affect ground-water quantity, recharge, and transport characteristics.

Changes in permeability and transmissivity may result from mining subsidence that increases permeability through rock deformation in the overlaying formations. Mining may depressurize ground water in a rock unit below the mined rock and lower the potentiometric surface. Mining the coal resource creates a void that can increase transmissivity and water storage in the mined region. Water detention time may be increased or decreased depending on the storage volume and rate of water transmission. Changes in residence time may affect seasonal flow patterns.

Mining and mining related subsidence may intercept water from a surface-water source, perched aquifers, regional[1] aquifers, or fracture zones. Ground water may continue along its original flow path after interception or it may be redirected. Potential effects include a loss or gain in water quantity at a ground-water storage location, an increase or decrease in flow at an existing discharge point, and a newly created discharge location.

Interbasin transfer occurs when water is intercepted and redirected from one hydrogeologic basin into another basin. Interbasin transfers may occur between both surface and ground-water basins and are more likely to occur between sub-basins than between major river basins. Interbasin transfer becomes important when the water is re-directed to a basin other than where it is allocated for use.

Ground water is removed as moisture in the mined coal and evaporated by mine ventilation.

Ground-water quality changes may include changes in pH, TDS, nutrients, metals, salts,

organic and inorganic constituents. Mining may alter ground-water quality when it causes different types or sources of water to mix. Surface water may be intercepted by subsidence and mix with ground water. Springs and aquifers above the mine may be intercepted and mix waters with different qualities. Depending on the quality of the waters involved and the quantity or ratio of mixing, improvement or degradation of the water being monitored may occur.

Mining activities can also change the chemistry of the system directly. Mining activities may affect ground-water quality when mined surfaces are exposed to weathering and oxidation, which liberate acid and toxic materials, minerals, or salts that can be transported with ground water. Mine rock dust generally increases TDS and may change the chemical signatures. Spills, human waste, hydrocarbons, longwall fluids, and other chemicals used in operations may be discharged to the ground water.

GROUND-WATER INTERCEPTION AND WELL INFORMATION

Information about ground water in the CIA is reviewed for each of the underground mines. Ground-water interception, and ground-water well data are reviewed. Mine-water discharge analyses are discussed in the **SURFACE-WATER RESOURCE HYDROLOGIC IMPACT ASSESSMENT** in this CHIA.

Star Point Mine Ground-water Interception

Mining at the Star Point mine occurred in two ground-water regions and affected a third. These regions are defined generally and some interaction between them apparently occurs. The first ground-water region is located on the east side of the Bear Canyon Fault, the second is located on the west side of the Bear Canyon Graben within Gentry Ridge, and the third region is along the East Fault of the Pleasant Valley Graben (Map 3). The following section discusses water intercepted during mining operations for the three regions: 1) water intercepted east of the Bear Canyon Fault, 2) water intercepted along the Bear Canyon Fault, and 3) water intercepted west of the Bear Canyon Graben.

In general, mine-water discharge has not occurred from the Star Point Mine largely because the mine has pumped and diverted the water into old workings, and the mine has also consumed some of the water intercepted. The primary diversion of ground water occurred from June 1992 to December 1997 when water was pumped from the Gentry Ridge area, across the Bear Canyon Graben, and into the older Third Seam workings east of the Bear Canyon Fault. Volume increased rapidly from 1992 until it exceeded 1,300 gpm, from December 1994 to February 1995, then even more rapidly declined to less than 100 gpm by January 1997. Water was also pumped to Mother Goose sump in the Third Seam from the Wattis and Hiawatha Seams. During this pumping, decreased flows were observed at Upper Tie Fork Spring. Big Bear Spring and other Huntington water sources also may have been affected (Figure 1).

The water supply for the Town of Hiawatha has been piped from the Mohrland Portal to water-storage tanks near the town. Hiawatha UPDES 001 monitors water discharged directly at the Hiawatha Mohrland Mine Portal and UPDES 002 measures overflow from the water tanks, so except

for what is consumed from the water system, UPDES 001 and UPDES 002 combined represent the total discharge from the Mohrland portal. Prior to the pumping at Star Point Mine, average combined discharge from UPDES 001 and UPDES 002 had been approximately 350 gpm, but during the Star Point pumping this discharge rose to almost 650 gpm. Between November 1992 and July 1995, when there was no flow measured at UPDES 002, apparently because the water supply system was shut-down and water that would have normally gone to the water tanks was discharging through UPDES 001, an average of nearly 1,000 gpm was being pumped from the Gentry Ridge area of the Star Point Mine, and average discharge from UPDES 001 rose to 900 gpm, with peak discharge of 1,600 gpm in August and September 1993. When flow resumed at UPDES 002 in August 1995, the combined discharge reached a maximum of 1,650 gpm, but it dropped quickly and by the time pumping at Star Point ceased in 1997 the average combined UPDES discharge was less than it had been before pumping started. From the chart in Figure 1 it can be seen that the correlation between the Star Point pumping and increased discharges at UPDES001 and 002 looks strong; however, pumping at Star Point does not account for the high UPDES discharges that occurred in April and May 1991 and April 1992, just before pumping began, so there may be another, unidentified factor involved in addition to the pumping (Figure 1).

Star Point Mine: East Side

Most water intercepted east of the Bear Canyon Fault is pumped to sumps within the mined areas. Sumps located within the mine are shown on Map 3. The major sump areas are entitled Mother, Father, Baby, Twin, and New Goose sumps. Mother Goose sump is located in the Main West area of the Third (middle) coal seam. Father, Twin and New Goose sumps are located in the Wattis Seam workings. Baby Goose sump is located near the Mudwater discharge within the Third Seam. Flow meters that are monitored at Mother Goose sump measure water pumped to other areas of the mine (Star Point Mine Plan, p. 700-24).

Water discharged at the Mud Water Fan (UPDES UT0023736-001)has been monitored since February 1985: there has been no discharge from UPDES 001 since July 1987 (Star Point Mine Plan, p. 700-31).

Some water is used to supply culinary needs for the Lion Deck bath house and office. Water used from within the mine for culinary purposes has been monitored since February 1985. Losses from fan ventilation evaporation have not been estimated.

In-mine ground water was monitored at 16 locations from April 1985 to March 1986. The Star Point mine plan states, "The total instantaneous flow from the 16 in-mine measuring points is an indication of the majority of flow made within the mine, but does not necessarily reflect the total flow made within the mine." The average annual flow from the 16 in-mine measuring points was approximately 150 gpm from April 1985 to March 1986. Over that 12-month period, the discharge from the mine to Mud Water Canyon (Star Point UPDES 001) was 66,611,600 gallons, an average of 129 gpm. The average annual discharge from the mine to the surface facilities for coal washing and surface dust control was only 0.5 gpm (267,432 gallons). The average annual discharge for culinary use was approximately 4.4 gpm (2,289,000 gallons). Therefore, the total annual discharge from the mine to the surface was 134 gpm, excluding the undetermined flow that exits the mine as water vapor in the air." (Star Point Mine Plan, p. 700-25).

When the Star Point Mine Plan was updated in 1996 for permit renewal, 1WN6 and 9L12 were the only sites being used for in-mine monitoring. These two stations were last monitored in October 1997, and the last mine portal was sealed in January 2001.

The larger flows east of the Bear Canyon Fault occurred in longwall panels No 12 and No.3 (Map 3). The Star Point mine plan states on page 700-25, "...the flow from the long wall area No. 12 has diminished over time since its peak in September of 1985 when long wall panel No. 3 was started. In March of 1986, the flow jumped to 120 gpm: the increase in seepage was from increased pumping of recycled water from the sump areas for dust suppression in the long wall panel area". The proximity of this panel to the subsided area of the North Fork of the Right Fork of Miller Creek and a fracture zone probably influenced inflow in this region (Map 3).

Star Point Mine: Graben Crossing

A rock tunnel crossing was developed through the Bear Canyon Graben in 1989 to allow access to coal under Gentry and Castle Valley Ridges. The rock tunnel crossing extends from the Wattis Coal Seam east of the Bear Canyon Graben (elevation 8,492 feet) to the Wattis Coal Seam west of the graben (elevation 8,450 feet): the Wattis Seam is the only seam mined under Gentry Ridge. The rock tunnel is in the upper Blackhawk Formation, 200 to 325 feet above the Wattis Coal Seam. The regional aquifer system was confirmed to lie 160 feet below the graben tunnel with information from a drill hole that was drilled down from within the graben crossing.

Water encountered east of the graben is above the regional aquifer system in perched, primarily fracture related systems in the upper Blackhawk Formation. Water flowed into the mine at the eastern boundary fault, the Bear Canyon Fault, when the 2 nd Left and 2 nd West Mains intercepted the fault. Initial inflow at 2nd Left was 6 gpm from roof strata on the face offset (approximate elevation 8,780 feet). Within three weeks, liquified gouge at the faces of entries #2 and #3 flowed approximately 10 to 15 feet into the entries. Drilling from within the #1 entry penetrated 40 to 60 feet of gouge and fractured rock before tapping into a significant ground-water conduit (the drill hole penetrated 400 feet into the graben). Inflow from the drill holes peaked at about 150 gpm before dropping to 50 gpm after 2 weeks, to less than 10 gpm after 10 weeks, and subsequently to zero. In the 2 nd West Mains (approximate elevation 8,490 feet), Cypress experienced an initial inflow rate of about 20 gpm from the roof strata. This flow reduced to less than 10 gpm after 4 weeks. Very little water was found at the actual face. Inflow to the mine at the entry to the graben tunnel at 2nd West Mains dropped rapidly during drilling from 20 gpm to 10 gpm over a four week period. Since that time, the flow has dropped to zero, indicating the dewatering of a perched aquifer system (Star Point Mine Plan, pp. 700-11 and 700-12).

Star Point Mine: West Side

Cypress recognized the water table under Gentry Mountain would be intercepted during mining so they entered into a mitigation agreement with NEWUA. This agreement is discussed further under the section in this CHIA entitled **Material Damage.**

Water was encountered along the eastern Bear Canyon Graben boundary fault and in the 3rd south mains: 13 to 50 gpm were reported near the eastern Bear Canyon Fault Zone. Water also

seeped from the fourth right and fifth right mains through the floor. As mining continued down dip the larger flow rates (50 to 250 gpm) were recorded at the west side of the mined area near the headwaters of Wild Cattle Hollow.

Water from the Gentry Ridge area was pumped from June 1992 to December 1997 across the Bear Canyon Graben into the Third Seam workings east of the Bear Canyon Fault. Volume increased rapidly from 1992 until it exceeded 1,300 gpm from December 1994 to February 1995, then even more rapidly declined to less than 100 gpm by January 1997. Water was also pumped to Mother Goose sump in the Third Seam from the Wattis and Hiawatha Seams.

UPDES discharges from the Star Point Mine over this period were sporadic and usually low volume. However, discharges from the Mohreland Portal at the Hiawatha Mine mimicked the pumping rate of the Gentry Ridge - Graben Goose pump (Figure 1), so it is a reasonable conclusion that some of the mine-water discharged from the Hiawatha Mine originated as water pumped across the Bear Canyon Graben in the Star Point Mine.

The total interbasin transfer of water pumped from Gentry Ridge to Area 8 was estimated by the Division. Instantaneous flow rates from the Gentry Ridge monitoring station were reported for June 1992 through December 1997. Water quantities reported to the Division were instantaneous readings only: no totalizing flow rates were reported. The techniques and assumptions used to estimate the total flow pumped are presented in the following paragraphs.

Flow rates from the Tie Fork Well and flow rates monitored at the Gentry Ridge (GENTRID) in-mine monitoring site were used to estimate the quantity of interbasin transfer. Flow losses estimated for the Tie Fork Well were smaller than the flow volume estimated to be pumped across the Bear Canyon Graben, suggesting waters from other sources were intercepted by dewatering activities in the Gentry Ridge area.

Losses at Upper Tie Fork Spring were estimated from data received on December 18, 1997 from Darrel Leamaster, Manager for CVSSD. The following assumptions were made to obtain the estimated flow loss:

- 1) Missing data from November 1993 through April 1994 were estimated by interpolation between the October 1993 and May 1994 flow rates;
- 2) The average monthly flow prior to dewatering was assumed to be equal to 85 gpm (the rate observed on October 1991 prior to a recorded decrease in flow at the spring);
- 3) The dewatering period was assumed to extend into April 1996 simply because the Tie Fork wells regained the 85 gpm flow rate after this date. Flow rates recorded from November 1991 through April 1996 were subtracted from 85 gpm then added together to estimate the total loss of flow at Upper Tie Fork Spring.

Using the method described above it was estimated that the total flow volume decreased by 139.5 AF during the period of mining under Gentry Ridge. The estimated maximum annual loss was 58.7 AF in 1995. The maximum loss to flow at Upper Tie Fork Spring occurred in May and June of 1995 and was 46 gpm (0.1cfs). A percentage of the loss can be attributed to climate, but adjustments for climate were not assessed.

A monthly flow volume was determined and then totaled for the period when water was pumped from Gentry Ridge across the Bear Canyon Graben into Area 8, east of the graben. The following assumptions were made to estimate the flow volume pumped from Gentry Ridge:

- 1) Where there was one record per month, that value was applied to the entire month;
- 2) Where there was more than one record per month, the first recorded flow volume was applied from the first day of the month up to the date of that measurement, the volume of the second measurement was applied from the date of that measurement through the end of the month, and the average of the two measured flows was applied to each day between;
- 3) Where monthly flow values were missing, flows from the preceding and following months were averaged;
- 4) The pumping rate was assumed to be continuous, 24 hours per day.

Using this method the total water transported across the graben was estimated to be 4,584 AF.

The Star Point Mine Graben Goose information provided to CVSSD was obtained on April 17, 1998. The data are available for June 1992 through December 1997: however, data for a period from February 1993 through July 1993 are unavailable because the meter was not functioning. The maximum reported instantaneous flow rate from both data sets is 1,600 gpm on January 26, 1994. The maximum monthly flow rates, 143 AF to 146 AF, occurred in March through May 1995 based on the average monthly rate in the CVSSD data. The maximum annual flow was estimated to be 1,627 AF in 1995. The total water pumped across the graben based on the CVSSD data is 4,645 AF and does not include an estimate for the missing data period.

From these analyses the approximate 4,600 AF pumped from the Graben Goose is large compared to the 139.5 AF loss estimated for Upper Tie Fork Spring. This suggests waters from other sources were intercepted during dewatering activities under the Gentry Ridge area.

Star Point Mine Ground-water Well Information

Star Point Mine wells are identified below in Table-IV-1 to aid in understanding the monitored formations. Graphs showing well water elevations are presented in figures 3, 4 and 5. The well data are grouped within each ground-water region: East of the Bear Canyon Fault (figure 3); Gentry Ridge, West of the Bear Canyon Fault (figure 4); and flows from Tie Fork Spring and related data, west of the Pleasant Valley Fault (figure 5). Well locations are found on Map 5 - Gentry Mtn. Geology.

Table IV-1: Star Point In-Mine Monitoring Wells
East of the Bear Canyon Fault

Well Number	Depth and Formation Monitored	Relative Location	General Observations
P86-01-TD	145 feet - Spring Canyon Sandstone -27 ft below the Hiawatha Seam.	East of the Bear Canyon Fault near the Mother Goose Graben.	Increase of 45 ft of head since 1993. Abandoned 1998.
P86-02-HD Btm - 8402 ft	71 feet - Spring Canyon Sandstone - screened below the Hiawatha (screen interval 50 ft)	East of the Bear Canyon Fault on west side of Hoag Ridge.	Water level has always been at or below the lowest well perforations - 8463 to 8413 feet. Abandoned 1998.

P86-03-WD	194 feet - Black Hawk screened below the floor of the Third Seam (screen interval 43.5 feet)	East of the Bear Canyon Fault on the west side of Hoag Ridge south of 86-02-HD and mining section 8 sumps.	Water level shows a small decline of 20 feet 8,320 to 8,300 feet with a few temporary drops that could be due to climate, localized de-watering and mine-water routing, depressurizing from mining, subsidence, or measuring error (Drops occur in Nov. 86, July 87, Mar 91, July 93). Abandoned 1997.

East of the Bear Canyon Fault - Figure 3

Well P86-01-TD, 86-02-HD, and P86-03-WD were in-mine wells. They were abandoned in late 1997 to mid 1998 because the area of the mine where they were located was sealed. P86-01-TD, developed in the Spring Canyon Sandstone and located on the East Side of the Bear Canyon Fault and Graben, increased in head during early 1994 when pumping rates from the "Gentry Ridge" in-mine monitoring site reached its peak discharge. This well is located south of the sumps located near the North Fork of Miller Creek. Well 86-02-HD was also developed in the Spring Canyon Sandstone. Water level was at or below the lowest screened elevation since it was developed. Well P86-03-WD, in the Blackhawk Formation below the Third Seam, has shown a decreasing trend since it was first developed in 1986 and probably represents dewatering from mining in the Hiawatha Seam.

Gentry Ridge: West of the Bear Canyon Fault

Well 86-26-6 (Figures 4 and 5), developed in the Star Point Sandstone Spring Canyon Tongue, responded in a pattern similar to Tie Fork wells 86-35-2-3 (Figure 5). Well 86-26-6 dropped a total of 34.7 feet during June through August 1995 and had recovered to 74 feet above the initial water elevation as of September 1997. Water levels have been measured by gas pressure, and measurements after September 1997 - and probably the August 1997 measurement also - are not valid because the gas line has been partially blocked.

Table IV-2: Star Point Mine Monitoring Wells West of the Bear Canyon Fault

Well Number (Period of Record) Collar Elevation Bottom of Well	Formation Monitored	Relative Location	General Observations
86-26-6 (6/94-7/97) C.E. - Btm -	Spring Canyon Tongue, Star Point Sandstone.	In the ridge between Wild Cattle Hollow and Gentry Mountain.	Water level pattern decreased 34.6 feet in the fall of 1995 and increased to 74 feet above the first recorded elevation as of July 1997.
P-92-01-A-WD* (1/92-10/97) C.E. - 8364.5* Btm - 8291.5 ft	Blackhawk- screened 61 feet below floor of Wattis Seam (screened interval - 8301.5 - 8291.5)	In the Bear Canyon Graben, near the Bear Canyon Fault.	Water level decreased about 32 ft from above screened interval to near the well bottom on 10/27/94 and 06/15/96.
P-92-01-B-WD* (1/92-10/97) C.E. - 8364.5* Btm - 8248 ft	Blackhawk- screened 104.5 feet below floor of Wattis Seam (screen interval 8258 - 8248)	Nested with P-92-01-A and C	Water level decreased about 50 ft in April 1995. With two anomalous drops on 10/93 and 10/94 that may be related to pressure change from mining, mine dewatering, sumping activities.
P-92-01C-WD* (1/92-10/97) C.E. - 8364.5* Btm - 8171.5 ft	Spring Canyon Sandstone-screened 45.7 feet below the Hiawatha (screen interval 8186.5 - 8171.5)	Nested with P-92-01-A and B.	Water level decreased a maximum of 108 ft 4/95.
P-92-02-WD (1/92-10/97) C.E. - 8362.24 Btm - 8156.2 ft	Spring Canyon Sandstone-screened 54.5 feet below the Hiawatha (screen interval 8171.2 - 8156.2)	In the Bear Canyon Graben/near the Nuck Woodward stream NW of well 92-01-WD.	Water level dropped a maximum of 126 ft 08/95.
P-92-03-WD (3/92-2/96) C.E. - Btm -	Blackhawk- screened 32.5 feet below floor of Wattis Seam (screen interval 10.5 ft)	In the Bear Canyon Graben/near the Bear Canyon Fault south of well 92-01-WD.	Water level was a flowing well (above well collar). The potentiometric surface was 8,408 feet (3/92). The water level dropped 155 ft; as of 02/96: the last measurement.
P-92-04-WD (3/92-10/97) C.E. - 8363.0 Btm - 8193	Spring Canyon Sandstone-screened 27 feet below the Hiawatha (screen interval 8204 - 8189)	In Center of Bear Canyon Graben. N of 92-01-WD and E of 92-02-WD.	Dropped a total of 54 feet by 3/95.
85-35-1 (7/88-9/97) C.E. - Btm -	Spring Canyon Sandstone	Tie Fork Well east of well(s) 85-35-2-3. East of Eastern Pleasant Valley Fault Boundary.	Flowing well, part of Upper Tie Fork Spring.
86-35-2-3; 86-35-2 and 86-35-3 (1/86-9/97) C.E. - Btm -	Spring Canyon Sandstone	Tie Fork artesian wells 200 ft apart. West of Pleasant Valley Fault	Flowing wells, part of Upper Tie Fork Spring. Reduced head since mining in Gentry ridge in 1992.
P93-01-WD (10/93-present) C.E. - Btm -	Spring Canyon Sandstone	This well has a screen interval of 1 ft.	The water level, originally at the top of the well perforation, decreased 1 ft and is dry since 2/94.
P-92-10-1 C.E. - Btm -	One point of data.	Completed near Nuck Woodward Stream	The initial elevation indicates a recharge mound.

*P92-01A-WD, P92-01B-WD and P92-01C-WD are nested wells.

Well 85-35-1 (Figure 5) is a flowing well and is also considered a part of the Upper Tie Fork Spring system. Flow from 85-35-1 jumped to 386 gpm on June 22, 1995, during the period

that Upper Tie Fork was at its lowest level because of mining at the Star Point Mine. Temporary in-mine sumping operations appear to have produced this spike in the flow at 85-35-1, and water-quality changes discussed in the following sections of this document also indicate mining has effected this well.

Wells developed in the Spring Canyon Tongue and located farther north and near the center of Gentry Ridge have not recovered to pre-mining elevations. By August 1995, wells P92-01C-WD, P92-02-WD, and P92-04-WD had fallen, respectively, 107 ft., 81.7 ft., and 117.7 ft below their initial potentiometric elevations. By December 1997, when they were last monitored, they had recovered part of the loss (Figure 4).

P92-03-WD, P92-01A-WD, and P92-01B-WD, wells completed in the Blackhawk Formation, also decreased in head during mining (Figure 4). The most notable decrease was at well P92-03-WD, which began as a flowing well when it was developed in March 1992. The water level dropped 70 feet during mine dewatering, and only a very slight recovery of 0.4 ft was observed from February to May 1996, when monitoring ended. The decrease in head at P92-03-WD may be a function of its position south (down gradient) of P92-01B-WD and P92-01A-WD. Some of the water from this location may now be redirected and contribute to the increased flows at Upper Tie Fork.

P92-01A WD dropped 32 ft and P92-01B-WD dropped 73 ft during mining of the Gentry Ridge area. At the time monitoring stopped in December 1997, water elevation at P92-01A WD had recovered to 30 ft below the initial elevation and at P92-01B-WD had recovered to 34 feet below the initial elevation (Figure 4). The variation in response between these wells can be attributed to two factors: 1) The well screen elevation relative to the mine dewatering activities (i.e., above or below the de-watered coal seam), and 2) The permeability within and below the well, which may limit rates of water loss from the formations.

Upper Tie Fork has been discharging above the pre-earthquake flow rate since late 1996, indicating both the earthquake and the mining activities probably effected the flow. Intercepted connate water (old water trapped in the formation when formed) and changes in the ground-water recharge area, porosity, and transmissivity are some mining related factors increasing flow at the Upper Tie Fork Spring. The wells that lie farther north and to the center of the graben may never recover to their initial elevation except during extremely wet climatic periods because there is increased storage capacity (porosity) in the mined region.

Bear Canyon Mine Ground-water Interception

Flows have primarily entered the Bear Canyon Mine through fractures and channel sandstones. Some water was observed from roof bolts and from the mine floor. Flows from faults and fractures were stated to produce the largest volume of water flowing into the mine during the early mining periods. Flows from roof bolts in the ceiling typically flow moderately for one or two months and then eventually de-water (Attachment to Appendix 7-J, Bear Canyon Mine Plan). Water intercepted during mining has primarily occurred in the Blind Canyon Seam and not in the Tank Seam.

Blind Canyon Seam

The majority of ground water intercepted in the Bear Canyon Mine has come from the Blind Canyon Seam channel sandstone, which was deposited in a channel eroded into the coal deposits. Many similar sandstones encountered in coal mines are discontinuous, but this sand channel spans the mined area and appears to extend from the Blind Canyon Fault to the Bear Canyon Fault.

In August 1989 mining operations in the North Mains of the Bear Canyon Mine, in the Blind Canyon Seam, approached the margins of the channel sandstone in the mine roof. By November 1989 large roof drips began to flow into the mine in this area. Initial flows measured in February 1990 at SBC-9 were 120 gpm, and flows reached a maximum of 175 gpm in 1993 - 1994 (Figure 6).

In February 1992 monitoring began at SBC-10 in the 1st East entries: flow started at 250 gpm, and combined flow measured at SBC-9 and SBC-10 jumped to 382 gpm. Mining in the North Mains reached the main body of the sandstone in April 27, 1993, and SBC-9 was moved closer to the channel sandstone . Flows rapidly declined at SBC-10, dropping to approximately 25 gpm by 1994; however, from 1993 to 1995 combined flows were relatively stable at 150 to 200 gpm. SBC-10 became inaccessible in 1995. Flow at SBC-9 declined gradually from 1995 to 1999 and was 55 gpm when the area was sealed in November 1999. In 1997 water that is believed to be from the SBC-10 area began discharging from the gob at SBC-13: SBC-13 averages 30 gpm, and flow appears to be increasing (Figure 6).

Water users have postulated that water discharging from the channel sandstone was previously recharging Birch Spring; the details associated with Birch Spring flows are discussed in the **GROUND-WATER RESOURCE HYDROLOGIC IMPACT ASSESSMENT** section.

When mining began in the Blind Canyon Seam, the first inflows were identified as coming from the floor in the Second East Entry (Map 4) and it was thought that this water originated from the Spring Canyon Tongue. Initial hydrologic evaluations from the Bear Canyon Mine Plan Appendix 7-N (April 16, 1993) described the mine as intercepting the potentiometric surface of the Spring Canyon Tongue in the north ends of the North Main and Second East entries. It is now believed that this water originated from the Blind Canyon channel sandstone.

Before inflow from the Blind Canyon channel sandstone was encountered, water draining from faults and fractures produced the largest volumes flowing into the mine. The fault crossing in the East Bleeders (E ½ SE ¼ Section 14) was considered the principal water source feeding the portal sump (Bear Canyon Mine Plan, PHC). Inflow was approximately the same as the inflow that eventually came from the Blind Canyon channel sandstone. "Inflow to the East Bleeders continued until the summer of 1989, when water was encountered as the North Main entries were advanced northward. According to Wendell Owen, inflow to the East Bleeders gradually diminished and flow into the North Mains was approximately 110 gpm" (Bear Canyon Mine Plan, PHC).

Initial mining in the Wild Horse Ridge area will be in the Tank Seam, but plans are to construct a rock tunnel down to the Blind Canyon Seam and construct portals from inside when it has been determined where conditions are suitable. This seam has proven to be very wet in the northern end of the adjacent Bear Canyon workings, which are separated from the Wild Horse Ridge workings by the Bear Canyon Fault. Mining projection maps show the workings will remain approximately 1,000 feet east of this fault: Bear Canyon has been eroded along this fault and the Blind Canyon Seam crops out between the planned mine and the fault, and there are also large sections of burned coal along the outcrop. If water is present in the Bear Canyon Fault, mining the Blind Canyon Seam under Wild Horse Ridge should not interference with its flow.

On March 22, 2000 a Division Order required the Applicant to modify the permit application by including " a minimum of one in-mine drill hole..... in the northern portion of the Wild Horse Ridge Addition....." That requirement was complied with by addition of monitoring well DH-5, located at the northern boundary of the mine addition. The drill hole will be tested using the same methodology that was used in the previous in-mine wells, as described in Appendix 7-N of the Bear Canyon Mine Plan.

Tank Seam

The Co-Op Mining Company has drilled eight exploratory drill holes up into the Tank Seam from the Blind Canyon Seam (page 2-13, Appendix 7 - J, PAP). All were dry except one that flowed at 0.5 gpm. Stratigraphically, the Tank Seam is 250 feet above the Blind Canyon Seam and approximately 8 to 10 gpm of water has been pumped from the Blind Canyon Seam workings into the Tank Seam for mining operations.

Initial mining in the Wild Horse Ridge area will be in the Tank Seam. This seam has proven to be basically dry in the adjacent Bear Canyon workings, which are separated from the Wild Horse Ridge workings by the Bear Canyon Fault. Mining projection maps show the workings will remain approximately 1,000 feet east of this fault: Bear Canyon has been eroded along this fault and the Tank Seam crops out between the planned mine and the fault, and there are also large sections of burned coal along the outcrop. If water is present in the Bear Canyon Fault, mining the Tank Seam under Wild Horse Ridge should not interference with its flow.

Bear Canyon Mine Ground-water Well Information

Wells monitored at the Bear Canyon Mine include: DH-1A, DH-2, DH-3, DH-4, SDH-1, SDH-2, and SDH-3. These wells are shown on Maps 4 and 5. DH-1A, DH-2, and DH-3 were drilled into the Star Point Sandstone and developed in the Spring Canyon Tongue of the Star Point Sandstone. DH-1A was drilled on August 6, 1991 and DH-2 was drilled in September 1991. DH-3 was drilled in early 1992. DH-3 became inaccessible and was abandoned in November 1993. Replacement well DH-4 was drilled in January 1994. Wells SDH-1, SDH-2 and SDH-3 were drilled in 1994. Drill holes MW-117 and MW-116 lie east of the Bear Canyon Fault in areas where future mining is expected to occur; each has one water level measurement obtained in September 1996. No additional wells have been drilled for the Wild Horse Ridge addition, but there is a commitment to drill at least one additional in-mine well, from the entries into the Tank Seam, to monitor the Spring Canyon Tongue.

Hydraulic conductivities from the lower tongues of the Star Point Sandstone were obtained from slug injection tests when the wells were drilled. Information from these tests indicated a loss of drilling fluid in the Panther Tongue, below 410 feet, suggesting well DH-1 may have intercepted a fracture. DH-2 had a quick displacement of water and a hydraulic conductivity equal to 0.054 ft/min in the Storrs Sandstone. Water dating conducted on a sample from DH-2 shows a younger water (600 - 1,500 years mean residence time) than the Blind Canyon channel sandstone (1,400-2,100 years mean residence time).

Following recovery from the slug tests, the first notable change at DH-1A and DH-2 occurred in 1995: a ten-foot increase in head was recorded on July 13, 1995 at DH-2 (Figure 7), and water levels recorded at DH-1A, the well closest to DH-2, showed approximately a three-foot increase. These were short-lived increases and levels dropped back down within the year. It is possible that these were measurement errors or are the results of in-mine sumping operations; however, flow jumped to 386 gpm at Star Point well 85-35-1 in June 1995 (Figure 5), and water-quality changes were noted at both DH-1A and 85-35-1 at the time of these increases: water-quality data were not obtained at DH-2 during this period . The similarities in water-quality and flow or water-level changes at DH-1A and 85-35-1 during June and July 1995 suggest a fracture-flow connection between the Star Point and Bear Canyon Mines. No increased flow from the Blind Canyon channel sandstone was recorded during this period.

The second notable change at DH-2 is the drop of approximately three feet in 1996, followed by a further drop of 12 feet during 1997 and 1998 (Figure 7). During 1999, the last year monitored, elevations yo-yoed over a 12-foot range. This erratic behavior in DH-2 may indicate direct connection through fractures with the surface or with areas being actively impacted by mining. Except for the high in 1995 that was discussed previously, DH-1A showed a steady increase from mid-1992 through 1997.

Wells SDH-1 and SDH-2 lie within the same geologic region, north of the mine, between the Bear Canyon and Blind Canyon faults. The water elevation was 7,964 feet at SDH-2 in August 1995 when the well was developed. The observed water elevation at SDH-2 was 7,975.8 feet on September 02, 1997, an increase in elevation of 11.8 feet since the initial well development. The change in water elevation at SDH-2 may be the result of either climatic variation or mine pumping operations conducted at Star Point Mine, or of both.

Measurements indicate the Spring Canyon Sandstone potentiometric surface at SDH-2 is roughly 50 feet above the Tank Seam (approximate elevation of 7,925 feet). SDH-2 is 7,700 feet north of the northernmost Bear Canyon mine workings in the Blind Canyon and Tank Seams. The potentiometric surface in the Spring Canyon Tongue at in-mine well DH-4, located near the northernmost extent of mining in the Blind Canyon Seam, is approximately 300 feet below the Tank Seam. It is reasonable to assume that if there is any future mining to the north in the Tank Seam within the permit area, it will not intercept Star Point aquifer waters unless water is transported up-gradient by fracture flow. Perched aquifers above the coal may be intercepted and dewatered.

That the potentiometric surface is higher at SDH-2 than it is to the south at SDH-1 and DH-4, may indicate ground water is diverted somewhere south of SDH-2, possibly discharging to

Bear Canyon Creek, the McCadden Hollow - Trail Canyon drainage, or the Bear Canyon Fault Zone. Another possibility is that, although the data can be interpreted as indicating a single potentiometric surface, the wells may be measuring potentiometric surfaces from isolated systems.

SDH-3 is separated from Bear Canyon by the Blind Canyon Fault and an unnamed fault, and information from SDH-3 is more pertinent to the adjacent Trail Canyon Mine. Little information on the ground-water hydrology of this area is available.

Hiawatha Mine Ground-water Interception

The Hiawatha Mine had an extensive mining history prior to the enactment of SMCRA, therefore, a lot of information on mining from this period is unknown. Available information from references in the Star Point and Hiawatha Mine Plans are included.

The Middle Fork mine complex includes parts of the old Hiawatha No. 1 and No. 2 Mines that were closed in 1928. The No. 2 mine was used as a water storage reservoir that was constructed by sealing off the mine entries with reinforced concrete bulkheads. According to the mine plan, the bulkheads in the No. 2 Mine have been opened and the reservoir drained but the date it was drained is not presented. This reservoir contained about 60 million gallons (184 acre-feet) on average (Hiawatha Mine Plan).

The Mohrland Mine portal has been sealed, but mine water still discharges into Cedar Creek through a bypass system. This water was previously piped to the town of Hiawatha.

The Bear Canyon Graben eastern boundary fault was intercepted by U. S. Fuel Company in the 10th West Section in the King IV Mine. As indicated on page VII-3 of section 7.1 of the Hiawatha Mine Plan (September 1986) "large water flows have been encountered in the past, mainly due to contact with the Bear Canyon Fault, which is a major water bearing structure. Old mine workings have contacted the fault at several points and this probably accounts for most of the mine water presently being discharged from the Mohrland portal".

Information in the Star Point Mine Plan indicates that the 10th West encounter by U. S. Fuel with the Bear Creek Graben is located at an elevation of 8,180 feet, approximately 6,600 feet south of Star Point's graben crossing. According to a memorandum prepared by John Mercier of CPMC, dated May 23, 1983 (Star Point Mine Plan, page 700-12):

> "The 2nd Left encounter initially experienced little water inflow (at 6 gpm) from roof strata on the face offset. Within three weeks, liquefied gouge in the faces of entries #2 and #3 flowed approximately 10 to 15 feet into the entries. Underground drilling in the #1 entry penetrated 40 to 60 feet of gouge and fractured rock before tapping into a significant ground-water conduit. Inflow peaked at about 150 gpm from drill holes before dropping to less than 10 gpm after 10 weeks (the flow dropped to 50 gpm in two weeks). Inflow from the drill hole that penetrated the fault at the 2nd Left encounter has since dropped to zero.

A second encounter with the east side of the graben (in the 2nd West Mains) experienced an initial inflow rate of about 20 gpm from the roof strata. This flow was reduced to less than 10 gpm after 4 weeks of exposure. Very little water has been found at the actual face offset."

The Star Point Mine Plan states on page 700-12 that the King IV Mine lies below the regional water table. The ground water encountered in the 10th West came primarily from the floor through an area the size of a bushel basket. The fault was not penetrated; therefore, water encountered within the mine is presumed to be bounded on the west by the the fault system gouge zone and presumably receives recharge from areas east of the fault. No dates were presented to identify when water was intercepted.

The Hiawatha Mine presently is not conducting underground coal mining activities. However, Hiawatha Coal Company, Inc. became the operator in 1998 and it is expected that mining will resume at some time in the future.

Hiawatha Mine Ground-water Well Information

No well information is available for the Hiawatha Mine.

Trail Canyon Mine Ground-water Interception

Water discharging from abandoned portals at monitoring sites PS-1 and CS-1 originates from old mine workings in the Hiawatha Seam. Information from these sites is the only information on underground water from the Trail Canyon Mine area: there is no information on water intercepted during mining.

CS-1 discharges from the Community Mine (inactive in 1921) developed in the Hiawatha Seam, but the water originates from the Star Point aquifer along the Pleasant Valley Fault. Water in this mine was developed for culinary use by Trail Canyon residents in the 1960's and is in compliance with the drinking water standards (Trail Canyon Mine Bond Release Application Addendum, December 28, 1995). CS-1 is located on the west side of Trail Canyon, beyond the west edge of the Trail Canyon Permit Area Boundary. According to information in the Trail Canyon Mine Plan, the Trail Canyon Mine is hydrologically separated from CS-1 by the Trail Canyon Fault.

PS-1 is located on the east side of Trail Canyon in the Hiawatha Seam and was associated with the "Freed" Mines (operated from mid-1920's to 1936). Since 1970 water has been pumped from the Community Mine (CS-1) to the Freed portal and the Freed Mine is used as a culinary water storage reservoir. The portals to the Freed Mine were sealed in 1991 by the Division's Abandoned Mined Land Program but use as a reservoir was maintained. When culinary water is not being pumped into the reservoir from CS-1 no flow occurs from PS-1, indicating little or no

inflow occurs into PS-1 and indicating the piezometric surface of the Star Point/Blackhawk is below PS-1 and thus below the Trail Canyon Mine (Trail Canyon Mine Bond Release Application Addendum, December 28, 1995).

The Trail Canyon Mine was developed from 1938 through the 1980's on the east side of Trail Canyon in the Blind Canyon Seam. The mine workings were relatively dry. Water would have to fill the Trail Canyon Mine workings to the north, 100 feet above the mine portals, to filter through to PS-1. No discharge has been observed from the closed portals associated with the Trail Canyon Blind Canyon Seam indicating the workings are not flooded to that point (Trail Canyon Mine Bond Release Application Addendum, December 28, 1995).

Trail Canyon Mine Ground-water Well Information

No well information is available for the Trail Canyon Mine.

POTENTIAL HYDROLOGIC IMPACTS TO SPRINGS

Spring resources with a water-quality or water-quantity change noted over the mining period are presented and the data are discussed. The potential for noted hydrologic changes at these water resources are reviewed in relation to mining activities. Spring resources are categorically discussed on the basis of use; domestic, or wildlife and agricultural.

Spring SBC-14 (WILD HORSE RIDGE-6) is in a small sheltered area in the bottom of the drainage, adjacent to the proposed road to the Wild Horse Ridge portals. Despite steady flow (0.5 to 15 gpm measured from 1993 to 1997), there are no water rights on the water flowing from this spring. However, special care is to be taken during blasting and construction in this area to preserve not only this water source but also the pristine characteristics that make the area around this spring unique.

Spring Sources With Domestic Uses

Tie Fork, Birch and Big Bear Springs are the major resources identified as having associated domestic uses within the CIA. The changes in flow characteristics for these springs are presented and the impacts identified. The graphs for each spring are presented in Appendix A. For information on associated water rights see the discussion under **HYDROLOGIC RESOURCES - Ground-water Rights**.

Tie Fork Spring

Development History

In 1981 and 1982 CVSSD built a new water line to Tie Fork Canyon and developed Upper Tie Fork Spring (Map 6). In December 1982 Upper Tie Fork Spring was placed on the CVSSD system. Average flow was 85 gpm.

Artesian conditions were encountered in exploratory drill hole 85-35-1, drilled near the junction of Wild Cattle Hollow and Gentry Hollow in Tie Fork Canyon. It was noted by the driller that fractures were intercepted at a depth of 357 feet. Information available indicates that these fractures are located within the Spring Canyon Member of the Star Point Sandstone (Star Point Mine Plan). 85-35-1 was deeded to Huntington City in 1988.

Huntington City developed flowing wells 86-35-2 and 86-35-3 in the vicinity of several small springs near where the East Fault of the Pleasant Valley Graben crosses Tie Fork Canyon. 86-35-2 and 86-35-3 were drilled into either: 1) the breccia zone of the East Fault of the Pleasant Valley Graben, or 2) in an open sandstone fracture zone. The depths to which these two wells were drilled are unknown.

These three wells appear to have simply captured the flow from the previously developed Upper Tie Fork Spring and these three wells are now called Upper Tie Fork Spring: 86-35-2 and 86-35-3 are the major sources of the flow and are usually combined and reported as 86-35-2-3.

In October 1993 Upper Tie Fork Spring was removed from the system under an agreement with CPMC because potential mining impacts were identified at the Star Point Mine. The Lower Tie Fork Spring was then put into the system as water replacement. The Lower Tie Fork Spring is developed west of the eastern Pleasant Valley Boundary Fault.

Water Quantity

A flow increase was recorded at the Upper Tie Fork Spring in August 1988. This increase correlates with a 5.3 magnitude earthquake on August 14, 1988. After the earthquake, Upper Tie Fork Spring flow reached 133 gpm, then slowly dropped to 86 gpm in August and September 1991 (Figures 1, 5, and 8). Flows observed prior to the earthquake averaged 84 gpm.

Mining beneath Gentry Ridge appears to have caused a direct and rapid impact to Upper Tie Fork Spring. This is related to the pumping of water across the Bear Canyon Fault from June 1992 through December 1997 (Star Point Mine Plan). However, some of the decrease may be attributed to the drought occurring from February 1987 through August 1991 (See the PHDI data in Figure 8.) Flow declined to a minimum of 33 gpm in 1995, but recovered as pumping rates dropped and returned to pre-pumping levels by mid-1996, at which time there was still a small volume of water being pumped (Figures 1 and 8).

Mining activities and the earthquake have effected the flow rate at the Upper Tie Fork Spring. Flows have since rebounded to levels exceeding pre-earthquake and pre-pumping rates. Monthly flow reached a maximum of 142 gpm in October 1998 but has stabilized at approximately 125 gpm (Figure 8). The source of this additional flow is unknown, but it may be related to the reduction in flow at Big Bear Spring and the drop in water level in wells P92-03-WD, P92-01A-WD, and P92-01B-WD in the Gentry Ridge horst. The quick response time at the Upper Tie Fork Spring indicate a fault - fracture type flow system is present (Star Point Mine Plan).

VI. STATEMENT OF FINDINGS

Numerous hydrologic changes occurred over the period of mining in the Gentry Mountain CIA. Past changes that were identified as related to mining have been mitigated through agreements between the mine companies, water rights holders, and land owners. Mining in the CIA is therefore determined to have been conducted in accordance with applicable rules and without material damage.

No probability of material damage from anticipated mining operations has been found.

DAMAGE TO SURFACE-WATER RESOURCES

Miller Creek Drainage

Water Right number 92-174 located on the Right Fork of Miller Creek is owned by U. S. Fuel Company and is reserved for industrial purposes (3.3 cfs). U.S. Fuel Company made an agreement with CPMC to allow impacts due to mining. Prior to mining the flows were around 6 gpm (Star Point Mine 1996 Annual Report, Subsidence Monitoring Report). Although surface-water quality and quantity changes occurred because of mining in the North Fork of Miller Creek, no determination was made by the Division of Water Resources or the State Department of Environmental Quality showing that changes to the hydrologic balance would significantly affect actual or potential uses. These waters were outside of the USDA National Forest Boundary and therefore were not subject to the anti-degradation policy that applies within the USDA National Forest Boundary. Although TDS and sulfate levels have increased there was no identified impairment of the designated use, thus no material damage has occurred.

SUBSIDENCE EFFECTS

Noticeable cracks have occurred in the Blackhawk Formation where pillars have been pulled in both the Star Point and Bear Canyon Mines, in areas with a shallow overburden, and on narrow promontories and ridges with steep side slopes. As mitigation, some of these features were fenced to the satisfaction of the Forest Service. No material damage claim was identified in association with this subsidence from the land owner (USDA Forest Service).

Table V-1: Mine-water Discharges Reported by UPDES Discharge Monitoring Report

Limitations	Trail Canyon Mine-Bear Canyon Mine UPDES Permit UTG0040000 expires 4/30/2003			Star Point Mine UPDES Permit UT-0023736 expires 12/31/91			Hiawatha Mine UPDES Permit UT0023094 - Not located within the MRP. To be incorporated later.			PacifiCorp Deer Creek Coal Mine UPDES Permit UT0023604 expires 11/30/97		
Field pH (range)	6.5-9.0			6.5-9.0			6.5-9.0			6.5-9.0		
Discharge	3 0 - Day	7-Day	Daily Max	3 0 - Day	7-Day	Daily Max	3 0 - Day	7-Day	Daily Max	3 0 - Day	7-Day	Daily Max
Flow (gpm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TSS (mg/L)	25	35	70	25	35	70				25	35	70
TDS	NA	NA	2,000 (lb/day)	NA	NA	2,000 (lb/day) *1,300				NA	NA	2,000 (lb/day)
T-Iron (mg/L)	NA	NA	1.0	NA	NA	*2.0 (a)				NA	NA	1.0 (b)
Oil and Grease (mg/L)	NA	NA	10	NA	NA	10				NA	NA	10

a. Total Iron exceeding 2.0(mg/L) requires review of actions necessary to achieve compliance. No daily maximum will exceed 7 mg/L.
b. Total Iron standard may be approved if water-quality standard is not violated.
c. TDS limit applies to a total for all discharge points associated with this UPDES permit.
* Applies to site 001.

- Changes in water quality and quantity that cause irreparable damage so as to impair a use: These would be commensurate with identified land uses within and adjacent to the mine;

- Category 1 Waters within boundaries of a USDA National Forest, with specific exceptions, are designated by the Utah Division of Water Quality as High Quality Waters and are subject to the state's anti-degradation policy to maintain water at the existing high quality and prohibit new point source discharges of wastewater, treated or otherwise (UDWQ, 1994, R317-2-3.2 and R317-2-12.1,);

- The Utah Department of Environmental Quality, Division of Water Quality authorized discharge into surface waters under the Utah Pollutant Discharge Elimination System (UPDES); and

- Flow diminution demonstrated to be caused by mining activities that reduce the use for a water right appropriated by the state.

Applicable UPDES standards are listed in Table V-I. Additional limits apply to each site and are reviewed and presented in greater detail if the limit has been exceeded. Toxic pollutant discharge limitations apply, based on the occurrence and concentration level, and discharging or placing wastes that produce an undesirable effect is unlawful.

DAMAGE TO GROUND-WATER RESOURCES

Hydrologic Impacts to the Upper Tie Fork Spring were mitigated by Cypress through an agreement with the CVSSD and Huntington-Cleveland Irrigation Company.

Available information does not definitively identify a cause for the decline in flow at Birch Spring. There are spring development and maintenance aspects that may have effected water quantity, but all of these, especially earlier ones, are not documented or clearly understood. The source of the ground water and its flow path to Birch Spring are not clearly known, and other questions about changes in the quality and quantity of the ground-water resource at Birch Spring remain answered. Collection of additional data and information from the mine operators and the water users may, over time, lead to answers to some of these questions.

Big Bear Spring has an observed reduction in peak flows following mining in the CIA (Figure 14b). It has previously been determined by the UDOGM Board that evidence does not indicate a hydrologic connection between the Bear Canyon Mine and Big Bear Spring. Collection of additional data and information from the mine operators and the water users may eventually allow determination of the source of recharge and the underground flow paths to this spring.

Springs impacted by the subsidence occurring east of the North Fork of the Right Fork of Miller Creek were not specifically tied to a water right; therefore, no material damage was identified in association with these springs. Water was intercepted by the mine and is believed to re-issue down stream where new flow was documented.

V. MATERIAL DAMAGE CRITERIA

Material damage is not defined in either the Utah or Federal regulations. Criteria that are used to determine material damage to hydrologic resources in coal mining programs administered by other states or by the Federal office of Surface Mining (OSM) include:

- Actual or potential violation of water-quality criteria established by federal, state or local jurisdictions;

- Changes to the hydrologic balance that would significantly affect actual or potential uses as designated by the regulatory authority;

- Reduction, loss, impairment, or preclusion of the utility of the resource to an existing or potential water user;

- Short term (completion of reclamation and bond release) impairment of actual water uses that cannot be mitigated; and

- Significant actual or potential degradation of quantity or quality of surface water or important aquifers.

MATERIAL DAMAGE CRITERIA - RELEVANT STANDARDS AGAINST WHICH PREDICTED IMPACTS CAN BE COMPARED

The following criteria, alone or in-combination with other criteria, may be used to determine Material Damage and will be based on factors related to the use of a resource:

- Utah Department of Health Classification; waters in and adjacent to the CIA are classified as 1C -protected for domestic use with prior treatment, 3A- protected for cold water species of game fish and cold water aquatic life, and 4 - protected for agricultural uses;

- Water-quality Standards for waters of the State of Utah set by the Utah Department of Environmental Quality and the state Division of Water Quality (UDWQ, 1994);

- Primary (PDW) and secondary (SDW) drinking water standards set by the Division of Drinking Water in Rules for Public Drinking Water Systems, R309 (Utah Administrative Code);

- Water-quality standards, 40CFR Ch.1 Subpart 434.55, applies to underground mine-water drainage at Post-Mining Areas after best practicable control technology currently available is applied;

Table IV-10: Mine-water Discharges Reported by UPDES Discharge Monitoring Report

Hiawatha Mine-UPDES Permit No. UT0023094	North Fork Ventilation Fan UPDES-010			Hiawatha Complex Discharge UPDES-012			Hiawatha Miller Creek Mine-water Discharge UPDES-002		
	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.
Flow (gpm)	274	0	27.6	14	0	5.09	151	0	21.77
Field Specific Conductance umhos/cm	973	799	911	652	468	602.4	1199	577	943
Field pH	8.11	6.82	N.A.	8.4	7.5	N.A.	6.6	8.5	N.A.
TSS(mg/L)	14	4	9.43	63	N.D.	5.68	32	N.D.	2.07
TDS(mg/L)	918	641	718	540	213	343.3	1010	233	702
T-Iron (mg/L)	0.96	N.D.	0.53	.44	N.D.	0.07	7.0	N.D.	0.13
Oil and Grease	N.D.	N.D.	N.D.	2.33	N.D.	0.35	5.6	N.D.	1.46

Serviceberry Creek

The main stem of Serviceberry Creek has no water monitoring location; however, water monitoring site 10-1 is located in Sage Brush Canyon, an ephemeral drainage tributary to the Serviceberry Creek drainage, at the Star Point Mine permit area boundary (Map 6). This site has an average flow of 3.5 gpm and a maximum flow of 35.9 gpm.

Tie Fork Canyon

Water-quality changes in Tie Fork Canyon may occur from changes in the water quality of Upper Tie Fork Spring. No surface-water quality monitoring sites are currently monitored in lower Tie Fork Drainage. Sites 34-1 and 34-2 are located near the Gentry Hollow and Wild Cattle Hollow confluence (Map 6). When the discharge from Upper Tie Fork is not diverted into CVSSD's collection system, it may change stream water quality because of its significant flow rate. Tie Fork Spring water characteristics are discussed in the section on Tie Fork Spring..

UT0023094). The following UPDES sites have no recorded discharge over the period of record:

-003 Upper Coal Storage Yard Pond
-004 Pond #4, North of Slurry Pond #1 (reclaimed-no longer exists)
-005 Pond #5, East of Slurry Pond #1.
-006 Pond #6, East of Slurry Pond #4.
-007 Pond #7 South East of Slurry Pond #5.
-008 Middle Fork Mine Yard.
-009 South Fork Mine Yard.
-011 Truck Loading Pond.
-013 Number 6 Mine-water tank overflow.

All these sites have a period of record from July 1994 through May 1991 except for site -013, which has a period of record from May 1991 through July 1994.

The information presented in Table IV-10 summarizes data for the three sites with recorded discharge to the Miller Creek Drainage. These sites include: The Hiawatha North Fork Ventilation Fan (UPDES UT0023094-010), a discharge valve on the Mohrland Pipe Line that is monitored when drained (UPDES-012), and the Miller Creek Mine-water Discharge (UPDES-002).

Mine-water discharges from UPDES No. UT0023094-002 through a pipe south of the Hiawatha Preparation Plant area, enters an underground culvert beneath the preparation plant, exits the culvert to the north of Refuse Pile #4, and finally drains to a tributary to Miller Creek. Iron coatings are observed at both the mine pipe and culvert discharge locations. To check for acid production, Bob Davidson and Susan White of UDOGM conducted sampling during a site visit on July 8, 1977. Although the mine water is acidified within the mine increasing the ferrous iron (Fe +2) concentration in solution, the contact with CO_2 and $CaCO_3$ raises the pH and results in Fe $(OH)_3$ deposition and pH within the 6.5 -9 limits.

committed to collect additional data to determine if the fractures are healing. (Star Point Mine, 1996 Annual Report, Subsidence Monitoring Report), but the outcome of further investigations is not known at this time

Debris Slide/Rockfall Deposition

In October or November 1988, a rock slide moved soil, rock, and vegetation into the North Fork of the Right Fork of Miller Creek. The debris slide, about 150 feet wide, originated in the Blackhawk Formation and Castlegate Sandstone. The movement of water through this debris could account for some of the changes in the chemical composition of the water that are discussed below.

Subsidence and Surface-water Quantity Changes

Streamflow appears to have increased through the stream reach traversing the Blackhawk Formation. Direct seepage to the stream from ground water is about 21 gpm; however, of the 15 gpm increase between measuring points M-6 and M-8, a substantial inflow is presumed to be derived from the the Star Point Sandstone and a channel sandstone at the base of the Blackhawk Formation where the Hiawatha Coal Seam has been locally displaced. According to the Star Point Mine 1996 Annual Subsidence Monitoring Report, the increase in flow due to seepage from the ground-water system was anticipated from the Spring Canyon Member of the Star Point Sandstone. The water table identified within the Spring Canyon Member flows to the southeast toward Miller Creek. The remaining 12 gpm increase measured between M-2 and M-8 is believed to be derived from the regional aquifer system of the Star Point Sandstone.

According to the Star Point Mine 1996 Annual Subsidence Monitoring Report, the loss in streamflow between measuring points M-9 and M-14 is believed to be due to flow from the stream into alluvial deposits that are present in the channel below station M-9. North Fork of the Right Fork of Miller Creek experiences a substantial gain in stream flow through the Storrs and Panther members of the Star Point Sandstone, based on a 49 gpm gain in flow between measuring points M-14 and M-15.

Subsidence and Surface-water Quality Changes

The most downstream point of impact to North Fork of the Right Fork of Miller Creek is at monitoring Site M-8. Selected water-quality parameters at this point were used to summarize the resulting change in water-quality characteristics to Miller Creek from mining subsidence. Water samples collected indicate the concentration of dissolved constituents increased from 310 to 799 mg/L between September and December 1988 and the type of water changed from magnesium calcium bicarbonate to magnesium sulfate. Dissolved solids increased to a maximum of 1,602 mg/L in July 1990 (Slaughter and others, 1995).

Mine-water Discharge Surface-water Quality Changes

The Hiawatha Mine surface facilities are located primarily within the Miller Creek Drainage. Numerous UPDES Discharge points are associated with the mine (UPDES Permit No.

Subsidence Impacts

Longwall mining in the Wattis Seam began August 2, 1988 and ended April 26, 1990. The Third Seam was mined in December 1990 through November 3, 1991. The overburden thickness above the Wattis coal seam is about 300 to 500 feet. As a result of subsidence, three surface fractures - 8 inches, 4 feet and 7 feet wide - had occurred by August 1992. The following changes to the hydrology of the Right Fork of Miller Creek resulted from the longwall mining. (Slaughter and others, 1995):

- Intercepted surface flows occurred at two locations. Surface water was diverted into fractures;
- Debris slide/rockfall deposition associated with subsidence occurred in the North Fork of the Right Fork of Miller Creek;
- Intercepted water was discharged at a new location where the existing channel traversed the Star Point Sandstone below the coal seam (surface-water monitoring station M-8); and
- Water-quality changes downstream of the mining included increased TDS from 300 mg/L to 1,500 mg/L and changed from predominate ions of magnesium, calcium and bicarbonate to predominate ions of magnesium and sulfate.

Intercepted Flows

The two interceptions of surface flow occurred in the North Fork of the Right Fork of Miller Creek in Section 18, T. 15 S., R. 18 E. and in a side canyon to the North Fork of the Right Fork in Section 12 (Star Point Mine, 1996 Annual Report, Subsidence Monitoring Report). The 1996 Star Point Mine PHC quantified the loss to stream flow as "...the maximum potential loss to the base flow of the North Fork of the Right Fork of Miller Creek is less than nine gpm".

The subsidence features in the North Fork Right Fork of Miller Creek located in Section 18 are associated with fractures. The stream water was diverted into the mine near subsidence monitoring point GS-1 in 1989. The subsidence affected a section of the stream approximately 800 feet long. (Star Point Mine, 1996 Annual Report, Subsidence Monitoring Report). The stream was diverted into the fractures at surface-water monitoring point M-6 in January or February 1989. At this location overburden is about 300 feet above the Wattis Coal Seam.

The side canyon to the North Fork of the Right Fork of Miller Creek, in the northwest quarter of Section 12, T. 15 S., R. 18 E., was diverted into the ground due to mining subsidence sometime between January 27 and April 27, 1989. It was again diverted at an upstream location in June 1990. Both surface-water interceptions occurred at sandstone-siltstone contacts. Overburden above the Wattis Seam is about 500 ft, at monitoring site M-3 (Slaughter and others, 1995) and subsidence was associated with known faults. Subsidence varied from hairline fractures to 6 inches and vertical displacement across the cracks varied from none to 2 feet. Width varied from hairline to about 2 feet. The cracks were fenced in the summer of 1991.

Beginning in July 1990, flow was observed in the section of the stream where flow had been previously intercepted. Flows have been observed during years with increased snow precipitation. These flows may suggest the fractures are healing. The Star Point Mine

THE PRICE RIVER BASIN

Sand Wash Drainage

Potential discharges within the Sand Wash Drainage would come from two UPDES discharge points located at the south west end of the Hiawatha Mine (UT0023094-006A, and -007A). No discharge has been recorded for these sites.

Mudwater Canyon

Mudwater Canyon has one mine discharge point from the Star Point Mine,UT0023736-001. This drainage is in an ephemeral system and impacts are expected to be minimal, therefore extensive review was not conducted for this CHIA. Data from monitoring the UPDES parameters are summarized in the Star Point Mine Plan. Their table lists the recommended EPA standards for wildlife as taken from the EPA. The results from their table show the following:

- pH, Iron, and Manganese are well below EPA standards;
- Oil & Grease and Total Suspended Solids levels are low; and
- TDS levels have increased significantly in 1996, but the level discharged is still no higher than the receiving stream.

Fish Creek

Some portions of the Fish Creek drainage along Wild Horse Ridge may be subsided. Otherwise, there should be no impacts from mining in this drainage. Monitoring station FC-1, near the mouth of Left Fork of Fish Creek, was added to the Bear Canyon Mine plan to monitor water quality and quantity in the creek.

Miller Creek Drainage

The direction of ground-water movement from Star Point Ridge, east of the Bear Canyon Graben, is down-dip to the south-southeast, toward Miller Creek. Baseflow to Miller Creek from the Star Point Sandstone was estimated to be on the order of 62 gpm, based on a stream survey conducted on the North Fork of the Right Fork of Miller Creek. Baseflow from the regional aquifer at the time represented approximately 50 percent of the total streamflow within the creek (Star Point Mine Plan, page 700-10).

Significant baseflow occurs to North Fork of the Right Fork of Miller Creek where the stream crosses the Star Point Sandstone. Between the headwaters region and stream monitoring station ST-1, sulfate concentrations increase significantly.

TDS concentrations at ST-1(same as M-15 - see Map 6 for locations of monitoring stations) ranged from 240 mg/L to 1,472 mg/L over 10 years between August 1980 to September 1990 (Star Point Mine Plan). Specific conductance at M-14 was measured at 592 micro-mhos per centimeter and doubled to 1,190 micro-mhos per centimeter at ST-1(M-15), indicating a significant inflow of poorer quality water.

to be in compliance with the mine's UPDES permit.

TABLE IV-9: Bear Creek Total Dissolved and Suspended Solids

	Total Dissolved Solids (mg/L)		Total Suspended Solids (mg/L)	
Station	Historic Average	Historic Maximum	Historic Average	Historic Maximum
Upper Bear Creek BC-1	498	3,200	2,789	23,098
Lower Bear Creek BC-2	459	3310	2,527	22,270
Mine-water Discharge UTG04006-004	333	998	8.3	46

Data from UDOGM database.

From a total of 110 TSS mine-water discharge samples, 65 samples were below the detection limit and 45 above the detection limit. Average TSS was 8.3 mg/L. The maximum mine-water discharge value recorded as 46 mg/L, which is much lower than the levels recorded for Bear Creek.

The minewater discharge, containing little sediment, can increase the waters ability to transport sediment (competence). The increase in competence may increase degradation (down cutting) below the discharge point until equilibrium is reached: however, the potential for increased sediment transport is naturally decreased because the gradient decreases downstream from the mine-water discharge. This in turn can create a shallow stream channel that will need to adjust to the sediment loading.

According to Susan White, Reclamation Biologist with the UDOGM, Bear Creek does not support fish and is not considered a cold water fishery. It may support some cold water species of macro-invertebrates. Huntington Creek is a local cold water fishery and has a Class 3A state water-quality designation. Recreational use (Class 2) of Bear Creek is primarily from the neighboring Trail Canyon City residents. The increased mine flow would not negatively impact the recreation at this site.

Total Dissolved Solids

The Class 4 water-quality standard for TDS is 1,200 mg/L. The maximum TDS level in the Bear Canyon Mine water is 782 mg/L with an average concentration of 363 mg/L, which is less than TDS concentrations upstream. Mine-water TDS may decrease the natural water TDS at the downstream Bear Creek site.

Additional Quality Standards

Acid forming discharges are uncommon in the region and acid forming materials are not known to be extensive in Utah coal mines. Should the presence of pyrite in the mine area cause a decreased pH locally the mixing with higher pH waters in the system would result in localized affects in the permit area and is not likely occur off the permit area due to downstream buffering.

Table IV-8 below summarizes Bear Creek flows and mine-water discharge. The average daily discharge at the Bear Canyon Mine is determined by dividing the total monthly flow from the in-line flow meter by the number of days in each month. Discharge rates can vary due to the rate of mining, in-mine sumping, and mining consumption.

Figure 18 shows the difference between flows recorded in Bear Creek at BC-1 above the Bear Canyon Mine and BC-2 below the mine. It also shows the discharge from UTG04006-004, the Bear Canyon Mine-water discharge point. Before significant discharge from the mine began, flows above and below the mine were similar. The larger flow downstream at BC-2 from 1991 through 1999 can be attributed to the Bear Canyon Mine discharge.

TABLE: IV-8: Bear Creek and Mine-water Discharge

Station	Pre-mine water Discharge Average (gpm) (8/80 -8/91)	Post-mine water Discharge Average (gpm) (8/91 - 2nd Q/97)	Historic Average (gpm) (8/80 - 2nd Q/97)
Upper Bear Creek BC-1	51.3	80.4	62.0
Lower Bear Creek BC-2	52.5	209	117
Mine-water Discharge UTG04006-004		Maximum (gpm)	Historic Average (gpm)
UPDES Discharge Point (4/1991 -3/1997)		782	141

Mining in the Tank Seam has been dry and requires that water be pumped from the Blind Canyon Seam, reducing the discharge to Bear Creek. A waterline was installed from the Blind Canyon Seam up through a borehole to the Tank Seam. Mining has artificially increased flows to the creek through mine-water discharge, therefore, mining consumption is not expected to decrease natural streamflow rates.

Water Quality

Sediment

Total Suspended Solids (TSS) levels in Bear Creak above the Bear Canyon Mine are typically higher than below the mine (Table IV-9). Mine water is discharged into Bear Creek between the upper and lower sites. The mine discharge water contains considerably less TSS than the stream water and dilution is a factor in decreases noted at the lower sampling location (BC-2). Additionally, the stream gradient decreases down canyon reducing stream velocity and allowing suspended sediments to be deposited.

TSS at BC-1 (upstream) and BC-2 (downstream) average 3845.7 and 3187.4 mg/L, respectively. During precipitation events large amounts of sediment are transported in Bear Creek, thus large data ranges are observed for TSS. The maximum TSS for the BC-1 and BC-2 are 37,940 and 28,092 mg/L, respectively.

The TSS levels from the mine water DMR (UTG04006-004) are lower than stream background levels. Water in the mine is contained in sumps until settling allows discharge water

Table IV-7: Minewater Discharge: Reported by UPDES Discharge Monitoring Report

Mine (period of record)	Maximum Monthly Flow		Maximum of the Monthly Average Flows		Average Flow	#Months with Zero Flow recorded
	GPD	Date	GPM	Date	GPM	GPM
Star Point UPDES-011 (10/1990-12/1997)	216,000	Nov. 1996	150	Nov. 1996	77	74 (from two sample records)
Hiawatha UPDES-001 Mohrland Portal (1/1979- 1/1997)	N.A.		^1,584	Aug. 1993 Sept. 1993	379.6	23
Hiawatha UPDES-002 Miller Creek (1/1983-3/1997)	N.A.		^1221	May 1991	159.6	22
Hiawatha UPDES-012 North Fork Vent (6/1983 - 7/1994)	N.A.		^14	May 1984	2.6	17
Bear Canyon UPDES-003 (4/1991- 3/1997)	504,000	Jan. 1992	318	Feb. 1992	148	0

N.A. means not available. ^ No averages available maximum and minimum determined from recorded point discharge.
*Averages, Minimum and Maximum were determined for months where there was a discharge. Months without discharge were not included.
Missing data are as follows:
Hiawatha -001Some months have no data record from the 1980's through the beginning of 1990.
Hiawatha -002Some monthly information is missing through the years in the period of record. Larger blocks of data are missing from 1986 through 1988 and in 1993 and 1994.
Hiawatha -010Some monthly information is missing through the years in the period of record.
Bear Canyon Some months have no data record from the 1980's through the beginning of 1990. An earlier discharge is reported in 1985 at 0.2 GPM.

THE SAN RAFAEL RIVER BASIN

Huntington Drainage

Nuck Woodward Creek and Little Park Canyon

Data from two monitoring sites were collected by Cypress Plateau on Nuck Woodward Creek above and below Little Park Canyon (Map 6). A brief data review showed no obvious changes to the water quantity or quality through the monitored period. There are no discharges from mine sites to this drainage.

Mining in the Castle Valley Ridge area was designed to protect the channel in Little Park Canyon by leaving a block of coal beneath the channel. This channel has been dry for at least 6 months each year during 1992 and 1993 making it an intermittent channel. No subsidence was recorded for this area.

Bear Creek

Water Quantity

Stream flow in Bear Creek varies greatly depending on precipitation and runoff factors.

induced land slides or rock fall may interrupt stream flow.

Streams within the CIA receive maximum flow rates in May through July in response to snowmelt runoff (Price and Plantz, 1987). Flows decrease significantly during the autumn and winter months. Summer thunderstorms may cause localized short-duration, high-intensity runoff.

Water Use

The Price and San Rafael River Basins are primarily used for stock watering, coal mining, electric power generation, and industrial purposes. Within the Castle Valley, agriculture and power production utilize nearly all of the in-flowing water (Mundorff, 1972). Flows in the gaged streams may occasionally approach zero. Storage reservoirs are common at higher elevations west and north of the CIA.

Minewater Discharge to Surface Waters

The mine water discharged from the Star Point, Bear Canyon, and Hiawatha Mines as reported by the Utah Pollutant Discharge Elimination System (UPDES) Permit, Discharge Monitoring Reports (DMR) are summarized in Table IV-7. The Deer Creek Waste Rock Site and the Trail Canyon Mine do not have mine-water discharge. All monitored sites do not provide data from a totalizing flow meter, therefore total flow volumes discharged from some mines are unknown.

and 5 where subsidence occurred (Map 3). This spring have been monitored on an irregular basis beginning in 1989. The only flow recorded was in May 1990; however, water-quality data were obtained on May 30, 1990 and July 15, 1991. This spring is roughly 1,200 feet above the Wattis Seam and was mined under in June 1987. From July 1987 through July 1988 longwall panels were mined in the Third Seam. This spring could have been directly affected by mining in the Wattis and Third Seams, but because there are no flow data prior to 1989, the impact of mining on the flow of this spring cannot be determined.

SURFACE-WATER RESOURCE HYDROLOGIC IMPACT ASSESSMENT

Potential surface-water impacts are presented then mine-water discharge information is discussed and data for drainages are reviewed for impacts associated with mining. The review focuses on the drainages with mine-water discharge or other identified potentials for impact.

POTENTIAL IMPACTS TO SURFACE-WATER QUALITY AND QUANTITY

Water Quality - General

Increases in TDS and sulfate are the most commonly observed changes in surface-water quality that result from mining in the CIA. These chemical changes are not often significant because there is a large variability in TDS in the natural system and the water quality degrades downstream naturally. Mining may alter surface-water quality when surface water is re-routed and mine-water flows are discharged to the surface.

Re-routing surface water may change localized water quality by increasing the runoff retention time from a mine-site and decreasing sediment loading. The changes in peak flows and sediment load may increase or decrease stream competence and downstream channel aggregation or degradation.

Mining operations may change water quality due to contamination from acid- or toxic-forming materials, hydrocarbon and chemical contamination, other materials associated with mining such as rock-dust and road salting, increased sediment yield from disturbed areas, flooding and streamflow alteration.

Surface-water quantity changes include mine-water discharge, losses to stream flow through interception from subsidence, and diversion of surface water. Re-directing surface water may change localized flow characteristics, increase the detention time for runoff from a mine site or may locally decrease or increase peak flows rates and flow velocities. Disturbed areas may increase the runoff volume and decrease infiltration, and sedimentation ponds may locally increase infiltration or evaporation rates. Mine-water discharges may be at constant or varied rates and be of sufficient volume to change the flow regimen. Subsidence holes or fractures that propagate to the surface may reduce or relocate streamflow or ephemeral flow. Subsidence

Water with an isotopic composition that plots below the meteoric water line is considered to be isotopically enriched, and that above is isotopically depleted. Isotopic enrichment or depletion may result from the climate at the time of precipitation, geochemical changes that have occurred in the subsurface, or both. The variation between the two Big Bear Spring samples may simply reflect seasonal changes. The data are insufficient to make a definitive interpretation.

Spring Sources with Wildlife and Agricultural Uses

Miller Creek Springs

Springs 229, 232, 238, 492, 494, 500, 530, 753, 978, and S18-2 (Map 6) were monitored in association with USGS Water-Resources Investigations Report 95-4025 (Slaughter and others, 1995). These springs may have been affected by subsidence caused by longwall mining in the Star Point Mine (Map 3). Discharge from spring 500 diminished, following mining in the Wattis seam but prior to mining the Third Seam. Discharge from spring S18-2 diminished substantially about the same time and then became dry after June 1991. Spring 229 diminished in mid-summer, which is not unusual, but the spring did not regain measurable discharge after June 1989. Slaughter drew no definitive conclusion on the effect of mining subsidence on spring discharge.

Water quality in four springs did vary between pre-mining and post-mining data with slight increases in sulfate and slight decreases in bicarbonate recorded at springs 530, 238, 492, and 978 in 1992. No substantial variation in water quality was determined between the pre-mining and post- mining periods by the USGS study (Slaughter and others, 1995).

New springs may have developed below Gentry Ridge along the coal outcrops southeast and down dip from the mine sumps and well P86-01-TD (Figure 3). Water was pumped across the Bear Canyon Graben from the west into Area 8 and the Mother Goose sump in the Third Seam (Map 3). In a field visit to the Hiawatha Mine in 1997, UDOGM personnel noted that a considerable amount of water was flowing from seeps above and along the coal outcrops in the South Fork of Right Fork of Miller Creek . If these seeps and springs resulted from the pumping operations at the Star Point Mine they would have been expected to diminish after pumping operations ceased. No seeps or spring surveys were conducted in this region during or following sumping operations, and there has been no follow-up visit by the Division.

Gentry Ridge Springs

On August 16, 1997, Lee Mc Elprang, a private citizen concerned for the springs and water rights in the area, accompanied David Darby of UDOGM; Liane Mattson, Jeff DeFreest, and Charles Yankowitz of the USFS; and John Pappas of the Star Point Mine to observed springs in the Gentry Mountain region near Wild Cattle Hollow (Map 6). There were concerns that springs 424, 450, 452, 753, 971, 458, and 486 had been affected by mining subsidence. During this site visit the springs were flowing; however, it was raining the day of the visit so flow rates could not be measured accurately. It should be noted that some factors had changed by the time these springs were visited: 1) the drought period lasting through 1995 had ended, and 2) mine de-watering had ceased. Spring 971 east of the Bear Canyon Fault lies over longwall panels 4

Table IV-5: Historic Lows and Highs for Selected Springs				
Source	**Historic Low Flow**		**Historic High Flow**	
	Flow (gpm)	**Month/Year**	**Flow (gpm)**	**Month/Year**
Big Bear Spring	76	5/1995	378	6/1983
Upper Tie Fork Spring	39	5/1995- 6/1995	142	10/1998
Lower Tie Fork Spring	41	10/1995	147	5/1995
Little Bear Spring	198	4/1995	484	1/1998
Birch Spring - NEWUA	2.5	11/1994	100	1/1990
Birch Spring - other extreme flows - see Figure 11.	15.8 (at SBC-5 just prior to redevelopment of the spring in September.)	8/1998	230 (Jimmy Staker via Ben Grimes: reliability of data unknown)	10/1990-1/1991

Water Quality

The change in hydraulic conductivity in mined strata may change the residence time for water traveling through the system. Data from the Big Bear Spring show a slight increase in TDS with time (Figure 16a), but this is probably related more to decrease in flow than to changes in residence time caused by mining (Figure 16b) . TDS was generally lower during the high flow period before 1988 (Table IV-6 - Note: TDS was not determined during the highest flows during this period). TDS was higher than average during 1990 - 1991 and 1995 - 1996. The 1990 - 1991 increase in TDS corresponds to when Star Point Mine began mining under Gentry Ridge, and also roughly corresponds to when Bear Canyon Mine began discharging water intercepted in the mine in 1987 and then increased discharge beginning in 1991. The 1995 increase corresponds to the period when flows at several springs were at their lowest due to drought and when pumping from the Gentry Ridge Horst across the Bear Canyon Graben reached its maximum average monthly flow (Figure 2). The high value in 1999 is an unexplained single-point anomaly, perhaps caused by lab or field error. No definitive conclusions can be drawn about the relationship between mining operations at the Star Point and Bear Canyon Mines and changes in TDS at Big Bear Spring, although some short-term increases do appear related to mining activities.

Table IV-6: Big Bear Spring TDS			
Station	Average - 1980 to 1988	Average - 1989 to 2000	Historic Average 1980 - 2000
TDS	289	360	350

Data from Bear Canyon Mine and CVSSD.

The data presented by Bear Canyon and Star Point Mines show that Big Bear Spring water differs in oxygen and hydrogen isotopic-ratios in relation to the Meteoric Water Line (Figure 17). Big Bear Spring data plot below the Meteoric Water Line for the sample presented by Co-Op in 1995 and the data plot above the water line for the sample obtained by Star Point prior to 1991.

quick increase in flow following this low and recovered to pre-drought output. Upper Tie Fork also recovered to pre-drought conditions but more slowly, probably affected by continued pumping at the Star Point Mine (Figure 5). Flow at Big Bear Spring also increased after the 1995 low but remained below pre-drought levels. Lower Tie Fork reached the low three months after Upper Tie Fork, and does not appear to have recovered significantly ((Figure 8).

Although Big Bear and Upper Tie Fork Springs had low flows recorded between April and June 1995, in May 1995 Lower Tie Fork had its highest recorded flow and the water level in well 85-35-1 spiked (Figure 5). All these extreme events occurred during dewatering of Gentry Ridge by the Star Point Mine. Lower Tie Fork Spring reached a low in October 1995, five months after the May peak. The 1995 lows at Little Bear and Upper Tie Fork can be simply explained by regional climatic influences, and at Big Bear by climate and pumping at Star Point Mine, but climate and pumping do not explain the peaks observed at Lower Tie Fork Spring and well 85-35-1. Lower Tie Fork Spring appears to respond independently from the other springs and it probably has a separate recharge zone.

The Star Point Mine may have intercepted ground water that previously reached Big Bear Spring, and some of that water may now be redirected to the Tie Fork Well. The Bear Canyon Mine may have also affected recharge by intercepting some of the waters that moved through local fractures and provided the pre-drought peak seasonal flows (Figure 14a).

Of these springs that have been discussed, Little Bear Spring is farthest from mining at the Star Point and Bear Canyon Mines, yet it was the first of these springs to reach minimum flow in 1995. It is significant that Little Bear Spring flow was at a minimum during this 1995 period (Figure 14a and Table IV-5) because Little Bear Spring is considered to be in a separate hydrologic system from the Gentry Mountain springs: it is located on the opposite side of Huntington Canyon and elevated well above the canyon floor. One hypothesis for recharge of Little Bear Spring was that recharge came from Huntington Creek through a fracture system; however, recent geophysical and dye-tracer work done by CVSSD is more supportive of a hypothesis that recharge is through fractures from Mill Fork Canyon, which is on the same side of Huntington Creek as Little Bear.

Potentially, flow at SBC-10 could be from a separate source because it decreased to a lower flow rate while SBC-9 remained at approximately the same flow rate. The water from SBC-10 may have originated from fractures unrelated to the channel sandstone.

Mining under Wild Horse Ridge is not expected to impact Big Bear (or Birch) Spring. Reasons for this conclusion are given in the PHC (Appendix 7-J, page 130-132):

1.) Faults with as much offset as the Bear Canyon Fault , 200 to 250 feet, are typically filled with low permeability gouge, which prevents movement of water both across and along the fault plane. Fault gouge is visible in the Bear Canyon Fault where it is exposed near the head of Bear Canyon;
2.) Fractures adjacent to such large faults typically transmit water parallel to the fault plane, but the fractures on the east (Wild Horse Ridge) side of the fault will not have good hydraulic communication with the fractures on the west side because of the fault gouge;
3.) Recharge most likely occurs in areas where the Panther Tongue crops out, rather than vertically through overlying strata;
4.) Dip is to the southeast, and ground-water flow will be strongly influenced to move in the direction of dip, rather than to the southwest towards Big Bear Spring;
5.) The gouge in faults will further inhibit lateral movement towards the west and Big Bear Spring;
6.) Water quality in three springs east of the Bear Canyon Fault is significantly different than water in Big Bear Spring, again indicating no or poor hydraulic communication between the Wild Horse Ridge area east of the fault and Big Bear Spring.

Hiawatha Mine Water Interception.

The dates when water was intercepted near the Bear Canyon Fault are not given in the Bear Canyon Mine Plan. However, the mean residence time of water flowing from the vicinity of the fault in the Hiawatha Mine is older than that for waters from the either the Bear Canyon Mine or Big Bear Spring (Table IV-4), indicating water intercepted near the Bear Canyon Fault in the Hiawatha Mine has not been flowing to either the mine or the spring..

Big Bear Spring Compared To Other Springs

Annual average flow from Big Bear Spring declined steeply from1986 through 1990, then remained fairly constant until the 1995 low (Figure 15). Bear Canyon flows increased in 1996 but did not approach the pre-drought flow rates, and have declined since. CVSSD worked on the collection system at Big Bear Spring from January to March 2001 in an attempt to recover additional flow: data were not available at the time this CHIA was written to determine if this was successful.

Big Bear, Little Bear, Upper Tie Fork, and Lower Tie Fork Springs had a historic low flow during 1995, but Birch Springs did not (Figures 14a and 11). Little Bear Springs showed a

Throughout the mining process, flow entered from the mine roof. Water also seeped through the floor in the 4th Right and 5th Right longwall panels, which were mined in 1992 and 1993. Inflows that were not associated with fracturing or faulting were relatively small. Some sections of the Gentry Ridge workings were noted to have damp conditions: 3rd South and 1st, 2nd and 3rd Right Mains had small wet areas on the floor. CPMC personnel speculated that this was indicative of conditions that would be expected in a aquitard located beneath the water table, and felt that these wet conditions were consistent with forecasts made prior to entry into the Gentry Ridge area.

Smaller inflows were found in the 3rd South Mains, near the Western Boundary Fault of the Bear Canyon Graben. Flow rates up to 50 gpm were reported 1992-1993, the size of these flows generally increasing as mining progressed to the south.

Bear Canyon Mine-water Interception.

Previous mining at this site dated back to 1938, but there had been a hiatus of approximately 30 years before Co-Op began mining at the Bear Canyon Mine in 1982, in the Blind Canyon Seam. Flow has been measured sporadically at SBC-7, a sump just inside the portals, in the old workings. Flow at SBC-7 was 18 gpm in March 1988 and generally remained at 16 to 19 gpm through November 1989. When monitored in February, May, and August 1990, water had ceased flowing at SBC-7, and after flows were measured in November 1990 and February 1991, this site was considered dry and monitoring was discontinued. The first significant flow of water into the new workings of the Bear Canyon Mine was from the roof near the sump in the East Bleeders. Flow was first measured from the sump at SBC-8 in March 1988, varying between 18 to 22 gpm until February 1989. The water originated from faults and fractures and produced the largest volumes flowing into the mine during the early mining periods. The combined flow of SBC-7 and SBC-8 was 30 to 40 gpm up to November 1989, after which flow into the mine at these two locations became inconsistent and then ceased (Figure 6).

Other significant inflows, recorded at SBC-10 and SBC-9 (Figure 6), originated from the Blind Canyon channel sandstone. In August 1989 mining operations in the North Mains of the Bear Canyon Mine, in the Blind Canyon Seam, approached the margins of the channel sandstone in the mine roof. By November 1989 large roof drips began to flow into the mine in this area. Initial flows measured in February 1990 at SBC-9 were 120 gpm, and flows reached a maximum of 175 gpm in 1993 - 1994 (Figure 6). The increasing inflow in the North Mains corresponded with the onset of inconsistent and diminishing flows at SBC-7 and SBC-8.

In February 1992 monitoring began at SBC-10 in the 1st East entries: flow started at 250 gpm, and combined flow measured at SBC-9 and SBC-10 jumped to 382 gpm. Mining in the North Mains reached the main body of the sandstone in April 27, 1993, and SBC-9 was moved closer to the channel sandstone. Flows rapidly declined at SBC-10, dropping to approximately 25 gpm by 1994; however, from 1993 to 1995 combined flows were relatively stable at 150 to 200 gpm. SBC-10 became inaccessible in 1995. Flow at SBC-9 declined gradually from 1995 to 1999 and was 55 gpm when the area was sealed in November 1999. In 1997 water that is believed to be from the SBC-10 area began discharging from the gob at SBC-13: SBC-13 averages 30 gpm, and flow appears to be increasing (Figure 6).

and formations above the coal. However, these panels are adjacent to the Bear Canyon Fault and mining could have intercepted flows that discharged to Big Bear Spring. A decreased peak flow was noted at the spring in 1987.

Bear Canyon Graben Crossing.

Fault related ground-water was encountered when the Bear Canyon Graben eastern boundary fault was intercepted by the mine at two locations: 1) the Eastern Boundary Fault 2nd Left (8,780 ft) and 2) the 2nd West Mains (8,490 ft). This information was obtained from a memorandum from John Mercier of CPMC (dated May 23, 1983 - see Star Point Mine Plan, page 700-12). A drill hole from the 2nd Left Main into the graben initially produced 150 gpm inflow but flow eventually decreased to zero. The precise date of this drilling was not presented in the mine plan.

The encounter on the east side of the graben in the 2nd West Mains produced an initial inflow rate of about 20 gpm from the roof. This flow reduced to less than 10 gpm after 4 weeks of exposure. Very little water was found at the actual face.

The rock tunnel crossing was developed in 1989. The water encountered in the graben crossing was believed to originate from perched systems associated with fractures (Star Point Mine Plan).

Other initial high flows water that later diminished were intercepted, but dates and locations were not identified in the Star Point Mine Plan. There has been concern that some of these high initial inflows drained fracture systems that provided recharge to springs associated with the fractures. Potentially these inflows have redirected flows previously discharging at the Big Bear Spring.

Gentry Ridge.

Larger inflows within the Gentry Ridge mine have been where mine workings intercepted segments of the western boundary fault of the Gentry Ridge Horst, which is also the eastern boundary fault of the Pleasant Valley Graben and may be continuous with the Trail Canyon Fault to the south (Map 3). Two large flows from floor fractures were encountered at the far western end of the 3rd West Mains. Combined flow was 100 gpm in January 1992, dropping to 40 gpm by April 1992, and was dry by May 1998 Star Point Mine Plan, page 700-63 and Sheet 728b). A roof fracture in the south mains for the second longwall panel (3rd Right Mains) flowed an estimated 100 gpm.in April 1992, but this was dry by October 1993. Approximately 50 gpm was measured flowing from the roof in the south mains of the third longwall panel (4th Right Mains) in May 1992, but this also was dry by October 1993. As mining progressed downdip, to the south, in 1993, flows of as much as 200 to 250 gpm were reported from the vicinity of the western boundary fault during development near the headwaters of Wild Cattle Hollow, but there are no additional data for these locations. Inflows were pumped from the mined section until late 1995 when longwall mining ceased. Subsequent to that time, in-mine waters have flowed unobstructed to the south wherein they have begun to re-establish the local ground-water potentiometric surface.

Figure 14a. Figure 14a also includes the Palmer Hydrologic Drought Index (PHDI) for Region 5 and flows for Little Bear Spring and Upper and Lower Tie Fork Springs. The PHDI is a drought index used to assess long-term moisture supply. It indicates the severity of a wet or dry spell, with negative values denoting a dry spell and positive values denoting a wet spell. The Little Bear Spring and Upper Tie Fork Spring are presented to show relationships with other water right sources held by the Huntington Cleveland Irrigation Company.

The most notable change in the flow characteristics at Big Bear Spring are losses in seasonal peak flows beginning in 1987 and 1988. A combination of the drought and mining in the Star Point and Bear Canyon Mines likely contribute to the decreased peak flows observed at Big Bear Spring. Figures 14a and 14b show the period of drought and recorded periods where water was intercepted within the Bear Canyon and Star Point Mines. The following sections describe these occurrences.

The Drought

The drought, based on data presented for the PHDI in Region 5, began in 1987 and lasted until around May 1993. Seasonal peak flows decreased at Little Bear and Big Bear Springs along with the drought index (Figure 15). The mean annual flow (obtained from the monthly means) did increase slightly from 1990 to 1996, but the magnitude of the increase in flow has not matched the increase in the PHDI. The slow response may result from mining influences or possibly a hysteresis effect following the drought (water recharges voids within the formation rather than discharging). The 1996 increase also corresponds to the period when pumping within the Star Point Mine across Gentry Ridge ceased. In order to understand the reduction in peak flows at Big Bear Spring the water intercepted in each mine is reviewed.

Mine Water

Star Point Mine-water Interception

East of Gentry Ridge

Intercepted ground water averaged 150 gpm from April 1985 through 1986 at the Star Point Mine. Flows originated from longwall panels #3 and #12 (Map 3). Longwall panel #3 was initiated in August 1982 and ended in March 1986. This panel was centrally located in the series of longwall panels just east of the Bear Canyon Graben and on the west edge of the mining block. Intercepted flow peaked within longwall area #3 in September 1985. Development of longwall panel #12 in the Wattis Seam was conducted in 1989 and the longwall was pulled in 1990. Little information on ground-water flow at the #12 longwall panel was found in the Star Point Mine Plan. According to the mine maps, panel #12 is located near the subsidence that occurred under the North Fork of the Right Fork of Miller Creek and is not suspected to be related to changes at Big Bear Spring.

Water intercepted in the Star Point mine in 1986 through 1987 averaged 218 gpm. During this period longwall panels #4 and #5 were mined in the Wattis seam. A surface subsidence fracture occurred above panel #4 that may have contributed inflow from the surface

Water flowing from Mohrland Portal is the oldest encountered in the Mayo and Associates samples, but TU values indicate a mixture with modern waters.

$\delta^{34}S$ represents the isotopic sulfur ratio and is used to identify sulfate sources in ground water. The Third West Bleeders and SBC- 9 have similar $\delta^{34}S$ levels, while the third west south and Birch Spring are lower. These $\delta^{34}S$ levels become important if geochemical modeling is conducted.

Big Bear Spring

Development History

The Big Bear Spring was developed as a water source by Huntington City around 1920. At that time a four inch transmission line was used to convey the water, but the line capacity was not large enough to transport all water available during peak flows. In 1977 Huntington City upgraded the spring boxes and collection systems and installed a meter. This meter was used to collect spring flow data and was operating when Terry Danielson (Danielson and others, 1981) collected samples for the USGS in April through December 1978.

In 1981 the CVSSD replaced the 4" line with a 6" line and a new meter, which is adequate to transport all the spring flow. Following the new meter installation, flows are measured on the 15th and last day of each month by the CVSSD. The collection system was again modified in early 2001 to capture additional flow, but the results have not yet been determined. The telemetric system, connected to the spring collection system in 1995, currently records hourly flow rates. The spring was redeveloped in 2000 in an attempt to capture flow that was bypassing the collection system.

Hydrogeology

Big Bear Spring issues from fractures in the Spring Canyon Tongue of the Star Point Sandstone. Recharge is believed to originate from an area north of the spring (Bear Canyon Mine Plan). No one has identified whether the recharge zone is from the east, west, or both sides of the Bear Canyon Fault. An older version (prior to February 1997) of the Bear Canyon Mine Plan stated "..the Bear Springs flow is derived from interception and channeling of water bearing zones from areas extending well to the north (up-gradient) of the site. This includes water bearing portions of the Star Point Blackhawk contact cut by the fault". Another hypothesis suggested that recharge came from Bear Creek and local faults and fractures. Although recharge to the spring from the creek is not confirmed, baseflow to Bear Creek comes from the Bear Canyon Fault. The fractures and faults of the Bear Canyon Graben and the shattered zone south of Tie Fork Canyon align with Big Bear Spring (Map 5); although these areas are several miles from Big Bear Spring, they have good potential as the sources for some of the recharge to Big Bear Spring.

Water Quantity

The changes in flow rates at Big Bear Spring over time are presented in Appendix A-

Table IV-4: Water Dating

Source	Date	Sample Source	Parameter		
			TU	Carbon 14 Dating (Years Mean Residence Time)	δ34S
Birch Spring	5/15/96	Co-Op	0.35		+3.8
	Not known	Star Point Mine	0.93		
	Not known	Earth Fax (Bear Canyon Mine Plan Appendix 7-J 4/30/93)	1.12		
	5/26/98	Mayo and Associates - Co-Op	0.49	1,700	+3.0
Source #1	10/29/98		0.33	3,600	+5.1
Source #2			0.37	2,500	+5.0
Overflow			0.47	1,100	-7.8
SBC-9	11/13/96	Mayo and Associates - Co-Op	0.50	1,400	
	1/6/99		3.62	2,200	+3.5
	5/15/96	SECOR	0.40		+11.4
3rd West Bleeder	11/13/96	Mayo and Associates - Co-Op		500	
	5/15/96	SECOR	2.22		+10.8
3rd West South	11/13/96	Mayo and Associates - Co-Op		5,400	
	5/15/96	SECOR	0.0		-0.6
Big Bear Spring	5/15/96	Co-Op	14.2		5.4
	pre-1991	Star Point Mine	17.7		
	11/13/96	Mayo and Associates - Co-Op	15.8		
	5/26/98		14	Mixed	+6.0
	10/29/98		17	Mixed	+5.1
Hiawatha - Mohrland Portal	6/10/98 and 10/12/98	Mayo and Associates - Co-Op	5.52 5.41	Mixed/9,000 Mixed/9,000	22

Except for one slightly elevated value of 3.62 TU from June 1, 1999 for SBC-9, there is no indication that modern water is present in Birch Spring or in the sand channel at SBC-9. Computed mean residence times were determined for the data presented by Mayo and Associates using the Pearson, Mooks, and Fontes models. The ages from oldest to youngest are; 3rd West South, Birch Spring, SBC-9, and 3rd West Bleeder (Map 4).

Although Big Bear Spring has chemical characteristics similar to Birch Spring dating indicates "mixed" waters with high TU identifying a modern or "young" component in the water recharging Big Bear Spring (Table IV-4). Chemical characteristics of the Trail Canyon springs are similar to Birch and Big Bear Springs; however, sampling to determine the mean residence time was not conducted on any Trail Canyon springs.

Conclusions made from the water dating analyses are; 1) the age of the water at SBC-9 (1,400 to 2,200 years mean residence time) and Birch Spring (1,100 to 3,600 years mean residence time) are similar, but all data considered together might favor Birch Spring as being slightly older, 2) no modern water was found at Birch Spring or SBC-9 water source, 3) water from the 3rd West Bleeders is younger in age (500 years mean residence time) than Birch Spring.

variation in concentration, values for sulfate in late 1990 and early 1991 at SBC-9 being greater than two standard deviations above average.. The variability of these data may indicate the variability in the sand channel water, influences from other water sources, or mining. Water sampled at SBC-9 has been taken from a sump that was relocated at least once during mining, and some samples may have been taken directly at channel sandstone. Samples from SBC-13, which is believed to be flowing through gob from the SBC-10 area, show water quality improving over time (Figure 13b), perhaps indicating that soluble minerals are being flushed from the gob.

The movement of water from the Blind Canyon channel sandstone through fractures to Birch Spring may change the water chemistry. Geochemical reaction modeling might determine if observed Birch Spring water chemistry could be derived from the water at the Blind Canyon Blind Canyon channel sandstone.

Water Dating

Results are summarized in Table IV-4. Sample locations are on Map 4. Samples obtained on May 15, 1996 were collected during a joint sampling effort between the water users, represented by Peter Nielsen of SECOR, and Co-Op. Data from Mayo and Associates are in Table 4 of the Bear Canyon Mine PHC (Bear Canyon Mine Plan, Appendix 7-J). Analysis results for one sample for Birch Spring were obtained from the Star Point Mine Plan: the date was not provided but the sample was collected prior to 1991 because the analyses results were first presented in 1991.

sediment. It was estimated that approximately 15 gpm flowed from source #1 after cleaning the box.

Information presented to date does not support the assertion that the decrease in flow from 1990 to 1998 was the result of mining operations. Information it is not adequate to identify the cause of the decline in flow at Birch Spring. There are spring development and maintenance history aspects that may effect water quantity but that are not clearly documented or understood. Many unanswered questions about the ground-water resource at Birch Spring remain. With time, additional data and analyses from the mine operators and the water users may provide the needed clarification.

Water Quality

Baseline quality samples were collected by Trail Canyon Mine from 1991 to 1993. Bear Canyon Mine, also operated by CO-OP Mining, collected baseline data at Birch Spring in 1986 and has continued to monitor Birch Spring under the Bear Canyon Mine coal mining plan. Specific conductance and TDS both show large differences between minimum and maximum values. However, such anomalies may be characteristic of high and low flows associated with natural climatic and erosional processes, especially if the spring is influenced by surface hydrologic events. The main water quality issues at Birch Spring have been the temporary increases in coliform bacteria and dissolved solids, oil-and-grease, and sediment during the 1989 - 1990 high flow periods. There have been no significant overall changes in water chemistry at this spring during this monitoring period; therefore, it does not appear there have been any permanent or long-term adverse effects from mining. Monitoring of this spring will continue in conjunction with the Bear Canyon Mine permit (C/015/025).

Data in the UDOGM database, summarized in Table IV-3, show SBC-9 and SBC-10 have a lower sulfate, bicarbonate, and chloride mean concentrations than Birch Spring, although minima and maxima sometimes do not show as clear a distinction. Mean solute concentrations tabulated in Table 3 of the Bear Canyon PHC (Appendix 7-J, Bear Canyon Mine Plan) are basically in agreement with Table IV-3.

Stiff diagrams are shown on Figure 15 of the Bear Canyon PHC: Stiff diagrams for SBC-9, SBC-10, Birch and Big Bear Springs, and springs in Trail Canyon are similar in appearance.

TABLE IV-3: SBC-9, SBC-10 and Birch Spring

Station	**Bicarbonate** (mg/L)			**Chloride** (mg/L)			**Sulfate** (mg/L)		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Birch Spring	371	439	102	9.7	25	3	117	298	38
SBC-9	354	440	270	6.18	27	0	44	206	20
SBC-10	321	412	152	7.9	20	0	52.1	100	5

Data from Bear Canyon Mine

Water quality varied some over time at SBC-10 and SBC-9, most notably the jumps in chloride concentrations in 1992 and 1998 (Figures 12 and 13a). TDS and sulfate also had some

north of the existing Bear Canyon Mine may have influenced the quantity of water seeping from outcrops above Big Bear and Birch Spring."

Water flowed from the cliffs at approximately the same elevation and the same stratigraphic section as the coal seam and the coal mine. Horizontal flow through the Blackhawk Formation is much easier than vertical flow because of multiple layers of low-permeability clay, siltstone, and sandstone. As in other scenarios, it is most likely that faults or fractures provide a path from the mine workings to Birch Spring, which flows from a stratigraphic unit below the mine sump.

Long-term Declines in Flow

Flow rates from 9.3 gpm to 23 gpm were recorded at Birch Spring by the USGS (Danielson and others, 1981) during a drought period in 1978 and 1979 (Figure 11).

It is unclear whether the peak flows in 1988 to 1990 influenced long-term discharge from the spring. The lack of congruity and consistency in flow data makes such a determination difficult.

Based on NEWUA records, flow at Birch Spring declined from 33 gpm in February 1990 to about 19 gpm in 1997, with a 16 gpm low flow recorded May 1997. This decline in flow could have resulted from the drought that began in 1987 and continued through early 1993. Flows continued to decline to a low of 14 gpm recorded on June 1, 1999. Flows appear to be recovering from this low. The last recorded spring discharge rate provided from NEWUA was 26 gpm on May 1, 2001, and data since March 2000 indicate flow is consistently above 25 gpm.

Birch Spring was originally developed in the 1970's. The spring boxes were updated in 1977, and the lines to the spring boxes were re-developed in 1980. Because flow rates from the collection system were not as large as expected, additional redevelopment work was done in the fall of 1984 and again in 1986. Co-Op has suggested that the explosives used to redevelop Birch Spring in 1984 and1986 may have opened fracture flow paths for water to by-pass the spring collection system (Co-Op letter, April 13, 1998).

Charles Reynolds noted in 1977 that water was issuing from the area between Huntington Creek and Birch Spring in a seep area that may have existed for two or three years, estimating from the vegetative growth in the area surrounding the seep. Co-Op felt this seep was the result of the collection system's reduced capacity and reduced ability to carry the available water.

The area over the spring collection system is well vegetated, which can reduce spring discharge through plant uptake and water transpiration. In 1998 the overflow pipe at the collection box was cleared of roots that were blocking flow. Silt may have accumulated in the lines as well.

In September 1998 NEWUA opened spring boxes #1 and #2. Pete Hess from UDOGM accompanied Jack Stoynoff from the NEWUA. Mr. Hess noted that water was running over the top of collection box #1 when it was uncovered and that when opened it was full of gravel and

Third Hypothesis

The third hypothesis suggests water sumped into the old workings at the Bear Canyon Mine resulted in the peak flows at Birch Spring. Pumping of water into the old south workings apparently began sometime after mid-1989 when water from the Blind Canyon channel sandstone began flowing into the North Mains, and ended in April 1991 when discharge to Bear Creek began under a UPDES permit. During this period, water was observed flowing over the road below Birch Spring.

Potential flow paths from this sump to Birch Spring could have resulted from subsidence features occurring adjacent to the mine sump area, at the southern end of the permit area (Map 4). This subsidence feature is located in the small drainage tributary to Birch Spring. Co-Op mined beyond the permit area boundary in an area beneath the drainage in 1985. During mining a subsidence hole, with an average six-foot depth, developed in the drainage channel and a large fracture formed approximately 100 feet west of the subsidence hole. Ventilation stoppings and a barricade were installed in the mine, but no seal was installed (memo to file from Peter Hess, March 27, 1995). Approximately 150 feet southeast and up-slope from the larger hole, a smaller diameter hole, approximately 30 feet deep, subsided. It is unknown when this subsidence hole formed. The holes and fractures were observed during a UDOGM inspection in the fall of 1994 and are described in Appendix 3-N of the Bear Canyon Mine Plan. (NOV N94-46-4-1B was issued December 12, 1994, the subsidence damage in the drainage was mitigated, and the NOV was terminated in 1997.)

The subsidence holes and fractures might have facilitated a flow path between the sump and Birch Spring that would not require any substantial head increase in the old-workings sump. Water was not suspected to have exited from the subsidence features at the ground elevation because the old workings are separated from the active mine by bulkheads. These bulkheads are unable to contain pressures from a water reservoir with a large hydraulic head. Water would have seeped from behind the bulkheads if approximately a 20 ft head required for discharge at the surface developed. According to Co-Op there was no seepage from the bulkheads. However, the subsidence features might have provided a subsurface path for water and a source for sediment from the old workings to Birch Spring.

The adjacent Big Bear Spring also exhibited excess water during the Birch Spring peak flows. In October 1990 water was observed exiting the cliff face south of the Bear Canyon Mine. In December 1990 through January 1991 icicles were noted from the cliffs above Big Bear Springs by UDOGM personnel and by Mr. Bryce Montgomery, hydrogeologist for CVSSD. It is believed that this discharge resulted from the water pumped into the abandoned workings at the south end of the Bear Canyon Mine. Sulfate, TDS, and oil and grease also increased in the Big Bear Spring water during this period.

According to the Informal Hearing Cause NO. C/015/025, UDOGM, under Findings of Fact: Relative Findings:

> #6 "There is evidence that pumping may have influenced quantity of flow from outcroppings at or near Big Bear or Birch Spring in the recent past."
> #7: "Pumping into the abandoned workings at the south end of the mine, directly

spring was redeveloped by NEWUA in September and October 1998, flow increased slowly, reaching a maximum of 21 gpm in October 1997. Since the 1998 redevelopment, flow has been as high as 27 gpm (Star point data, March 2000), but flows as low as 15 gpm (Star Point and Bear Canyon data, May and June 1999) have been recorded during the same period. Data since March 2000 indicate flow is consistently above 25 gpm.

Peak Flow Events

Three hypotheses explaining the 1988 to 1990 peak flows have been presented : 1) water may have been released from the bulkheads at Trail Canyon, 2) water intercepted within the Bear Canyon Mine was pumped from the Blind Canyon Fan Portal into Dry Canyon and reached Birch Spring through subsidence above the Trail Canyon Mine workings (Map 4), and 3) the water originated from the sump in the south workings at the Bear Canyon Mine.

First Hypothesis

The first hypothesis is that the 1988 to 1990 peak flows at Birch Spring originated from water stored behind bulkheads in the Trail Canyon Mine. Flow data for Birch Spring that are presented by CPMC for August, September, October, and November 1988 are considered invalid - as discussed above - but the high flow rates measured in December 1988 and later appear to be followed by periods of recession (Figure 11). These data also indicate a possible correlation with the August 14, 1988 earthquake. Hypothetically, water behind bulkheads in the Trail Canyon Mine was released during the earthquake and traveled along fault and joint systems to Birch Spring. However, it seems unlikely the three subsequent peak flows, which occurred some time after the earthquake, would be related to the earthquake.

A large sediment load was observed in Birch Spring collection system during the peak flows. A possible source of sediment in water originating at the Trail Canyon Mine would be a connection between the ground water and the surface. The only documented connection is a subsidence area observed on October 28, 1996 (Map 4). The surface subsidence effects in this area were on both sides of Dry Canyon and over a 100-foot-long section that dropped 6 to 8 feet along the ephemeral channel. This subsided area occurs over a mapped fault, the Dry Canyon Fault (west of the Blind Canyon Fault), that passes near Birch Spring. The subsidence was first identified on a map presented by Co-Op for the Trail Canyon Mine and dated March 22, 1983.

Second Hypothesis

The second hypothesis, presented by Mr. Galen Atwood for NEWUA during the 1996 Bear Canyon Mine informal conferences, contended that water intercepted in the Bear Canyon Mine was pumped from the mine through the Blind Canyon Fan Portal into Dry Canyon. This would have been in the late summer of 1989, when the 230 gpm flows were measured at Birch Spring. No factual evidence was presented for this hypotheses, although oil-and-grease, sediment, and dissolved solids levels and fecal coliform bacteria counts increased in the Birch Spring water during these high flows of late 1989 to early 1990. Again, the Trail Canyon Mine subsidence might have allowed connection along the Dry Canyon Fault to Birch Spring.

through 2000, flows averaged 22 gpm; however, there was a slight downward trend over this period. Because mining activities ceased at Trail Canyon Mine in 1982, there is little probability this downward trend is related to activities at Trail Canyon Mine.

Flow data indicate two significant concerns: 1) decreased flow was observed from 1991 to 1998, and 2) peak flows such as those recorded in December 1988, June 1989, October 1989 through January 1990, and June 1990 have not been seen since. The water source for the peak flows may be separate from the normal Birch Spring flow.

The Star Point Mine Plan provided information on flow at Birch Spring from January 1985 through December 1990 that is not available from other sources, and these flow data have also been used by both UDOGM and Co-Op in several documents and other matters relating to Birch Spring. The flow information was obtained by Ben Grimes, who was with Star Point at the time but was also President of NEWUA. The data originated with Jimmy Staker, an employee of NEWUA, who kept the records of his flow measurements at his home. Mr. Staker died several years ago and his original records cannot be found. Comparing the Birch Spring data between January 1985 and November 1988 with the data from Tie Fork Spring for the same time period, it is evident that they are the same. Because CVSSD's Tie Fork records are continuous and can be confirmed back to December 1982, and because the reported flows are more consistent with the historic flows at Tie Fork and less consistent with what little other Birch Spring flow data there are for the same period, these Star Point data from January 1985 to November 1988 are not considered valid for Birch Spring. Also, because there is no way to confirm them, the Star Point data from December 1988 to August 1990 are questionable.

NEWUA began measuring Birch Spring flows monthly in January 1991, using a bucket and stopwatch from January to December 1991 and using an in-line flow meter that was checked monthly with a bucket and stopwatch after January 1992. Prior to 1991 Co-Op measured only the overflow of the collection system, so Co-Op's early measurements do not include the flow in the collection system. Since 1991 Co-Op has at times reported NEWUA's measurements and at other times has made independent measurements, and Star Point began independent quarterly monitoring in October 1992: since 1991, the independent measurements of Star Point and Co-Op closely match NEWUA's data.

Peak flow discharges, attributed to Staker's measurements as reported by the Star Point Mine, reached 117 gpm during December 1988, 100 gpm in June 1989, 230 gpm in October 1989 through January 1990 and 85 gpm in June 1990. Both Co-Op and NEWUA data confirm high flow during the October 1989 through January 1990 period, 129 gpm (of overflow) in October 1989 from Co-Op and 100 gpm in January 1990 from NEWUA. Bill Malencik of UDOGM (memo dated November 1, 1989) measured 150 gpm on October 25, 1989, which did not include the flow in the adjacent ditch, reported to flow 80 gpm on November 3, 1989. Based on Staker's data provided by the Star Point Mine, each of these four peak flows at Birch Spring were followed by what appear to be periods of baseflow recession (Figure 11).

Following this series of peak events, flows declined rapidly and were measured at 40 gpm in September 1990. Flows held fairly steady at around 33 gpm through 1991, but then began decreasing slowly in January 1992, reaching a low of 14.5 gpm in May 1997. From then until the

An issue presented by the water users was whether water intercepted in the Bear Canyon Mine at the sand channel, monitored at sites SBC-9 and SBC-10, decreased recharge to Birch Spring. Water movement across major faults, such as the Blind Canyon Fault, does not seem likely based on the information presented to date. However, there is a possibility that secondary faults could transport water from the saturated sand channel exposed in the Bear Canyon Mine across the Blind Canyon fault to Birch Spring (Map 4).

In the southern region of the Bear Canyon Mine, joint and fracture sets are oriented N 15° E to N 17° E and a second set of minor joints are oriented N 60° E (informal conferences - Chris Hansen, Earth Fax Engineering). Mining in the Tank Seam has exposed a fault near the Blind Canyon fault, north of the Blind Canyon Fan Portal, that strikes N 17° E, is offset 1.5 feet, and is down-dropped to the west: it was also observed in the Blind Canyon Seam (letter from the Co-Op Mining Company, April 13, 1998). According to Co-Op the fault appears to terminate near the southern end of the Third West Bleeders, it did not intersect the Blind Canyon channel sandstone, and it appeared closed. A projected fault lies northwest of the Blind Canyon channel sandstone ("low coal area").

To the north, within the Star Point Mine permit area, faults and joint sets that formed perpendicular to regional extensional stresses are oriented N 5° W, N 6° E, and N 14° E. These joint sets are open. Ground and surface-water migration is common along these fracture systems (Star Point Mine Plan), but there is no clear flow-path to Birch Spring. The Dry Canyon Fault could provide a flow path from the "shattered zone" adjacent to Tie Fork Canyon to Birch Spring (Map 5).

Information was collected during a field visit by Charles Reynolds, Environmental Engineer for Co-Op, and Jim Smith, UDOGM Reclamation Geologist, on October 15, 1998. The field visit form and summary memo from Co-Op dated December 22, 1998 are presented in Appendix C. In summary, the documents stated the following:

- The fractures do not completely converge, and they parallel the Blind Canyon Fault within the mapped area.

- Most of the area is jointed. Joints appear to be gradually converging up slope and may actually converge northward or upward or both.

If the fracture zones or joint sets are open as a result of extensional stress they may be more likely to carry ground-water flow. Detailed mapping of faults and joints would be needed to fully understand the relationship, if any, of these fractures to the hydrogeology of Birch Spring.

Water Quantity

Birch Spring is located in Huntington Canyon, about one mile south of the Trail Canyon Mine. Flow measurements done prior to installation of a flow meter in January 1992 are very sporadic and many are of questionable reliability: the handful of more reliable flow measurements during this period ranged from 9 to 100 gpm (Figures 11a and 11b). From 1992

Birch Spring

Development History

Birch Spring was originally developed in the 1970's. The spring boxes were updated in 1977, and the lines to the spring boxes were re-developed in 1980 (Informal Conferences - permit renewal, cause No. C/015/025). Additional redevelopment work was done in the fall of 1984 because flow rates from the collection system where not as large as expected. Redevelopment in 1984 included some blasting and backhoe work conducted to increase flow rates followed by collection system burial under impervious material. The water was re-connected for use after the 1984 development work. The collection system was developed again in 1986 (Figures 11a and 11b). Explosives used to redevelop Birch Spring in 1984 and1986 may have opened fracture flow paths for water to by-pass the spring collection system (letter from the Co-Op Mining Company, April 13, 1998).

The area over the spring collection system is well vegetated, which can reduce spring discharge through plant uptake and water transpiration. In 1998 the overflow pipe at the collection box was cleared of roots that were blocking flow. Roots may also have been be clogging the collection lines, and silt may have accumulated in the lines as well.

In September 1998 NEWUA opened spring boxes #1 and #2. Pete Hess from UDOGM accompanied Jack Stoynoff from NEWUA. Mr. Hess noted that water was running over the top of collection box #1 when it was uncovered and that when opened it was full of gravel and sediment. It was estimated that approximately 15 gpm flowed from source #1 after cleaning the box. Box #2 was also opened and cleaned, and several of the pipes in the collection system were cleaned or replaced. Since this work in 1998, flow at Birch Spring has recovered to over 25 gpm (Figure 11b).

Hydrogeology

Birch Spring issues from the Star Point Sandstone west of the Bear Canyon Mine, however the source of recharge to the spring is unknown. The spring flows at a relatively steady rate, showing little or no seasonal variation even though numerous joints and fractures are found in the outcrops surrounding the spring.

Birch Spring issues from a fault, and it has been hypothesized that this fault is splay from the Blind Canyon Fault; however, field investigations have not identified such a connection to the Blind Canyon Fault, or any other major fault. Fractures in this area are parallel, with consistent vertical and north-south orientation. No transverse, interconnecting fractures have been observed in the vicinity of the Trail and Bear Canyon Mines, indicating that lateral hydraulic interconnectivity between faults and fractures is poor or nonexistent. The Trail Canyon Mine lies directly in line with the northward projection of the Birch Spring fault: the mine-workings map makes no note of this fault, but the text of the MRP mentions several minor faults encountered within the mine. Information in the Trail Canyon Mine Plan is sketchy, but there is no mention of significant or continuous flows into the mine workings from any source.

Additional discussion related to water quantity at Upper Tie Fork Spring is found in the section on **GROUND-WATER INTERCEPTION AND WELL INFORMATION** for the Star Point Mine.

Low flow - or baseflow - at Lower Tie Fork Spring did decline from 1994 to 1995, with low flow at Lower Tie Fork in 1995 lagging three months behind the lowest flow at Upper Tie Fork Spring (Figure 8). Although pre-pumping data are lacking, it appears baseflows at Lower Tie Fork were lower after mining than they were during mining, and annual low flow has not rebounded to the degree that it has at the Upper Tie Fork Spring. Lower Tie Fork Spring, developed in December 1993, does not have the same flow characteristics as the Upper Tie Fork Spring.

Water Quality

Water quality at the Upper Tie Fork Spring was affected by pumping at the Bear Canyon Graben. pH dropped as pumping started, reaching lows of 6 in January and June 1993. As pumping increased through 1994, pH values returned to pre-pumping values, although some high values were recorded. When pumping decreased in 1997, pH rose to over 8. After pumping stopped, pH returned to pre-pumping values (Figure 9).

When pumping started and as pH dropped, sulfate concentrations increased, reaching a high of 66 mg/L in September 1992. By January 1996, when pumping rates had dropped and pH values had risen, sulfate concentrations fell to near the pre-mining levels. However, since pumping stopped, sulfate concentrations appear to be in an upward trend (Figure 9).

Bicarbonate generally remained in the range of pre-pumping values during pumping, even though higher than usual concentrations were measured in September 1994 (320 mg/L) and June 1997 (327 mg/L). However, since pumping stopped, bicarbonate concentrations have been consistently high, over 350 mg/L (Figure 10). TDS fell slightly during the pumping period but recovered when pumping ceased: bicarbonate now contributes a larger portion of TDS than it did before pumping (Figure 10).

Baseline water-quality data for the Tie Fork Wells show sulfate concentrations are lower than those characteristic of the Blackhawk Formation. Recharge for these wells appears to originate within the Price River - North Horn perched system, which lies above the Blackhawk Formation (Star Point Mine Plan). Increases in sulfate concentrations, and possibly other chemical characteristics, to those similar to the Blackhawk Formation may result from mining. These chemical changes may be partially due to mixing water from the Blackhawk Formation with North Horn water, mixing with connate water, and from increasing residence time within the Blackhawk Formation by creating water storage reservoirs.

Changes between dry and wet climatic cycles may effect oxidation and reduction within the hydrologic systems and create water chemistry changes similar to those observed. Variations in TDS, sulfate, bicarbonate, and pH may occur during future climatic cycles, independent of any mining activity.

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APPENDIX A.

WATER RESOURCE HYDROLOGIC IMPACT ASSESSMENT FIGURES

Starpoint Pumping - Hiawatha Discharge

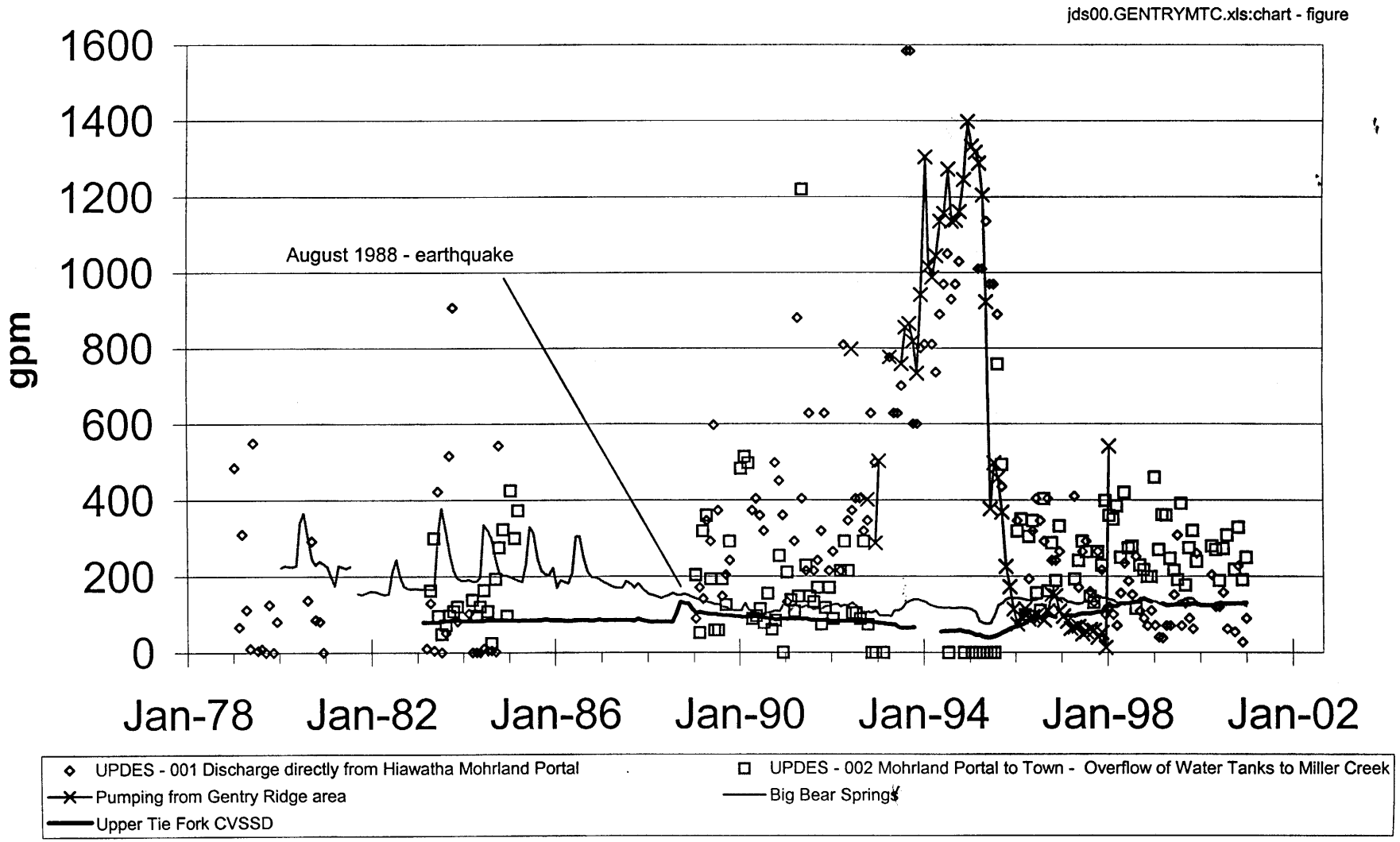
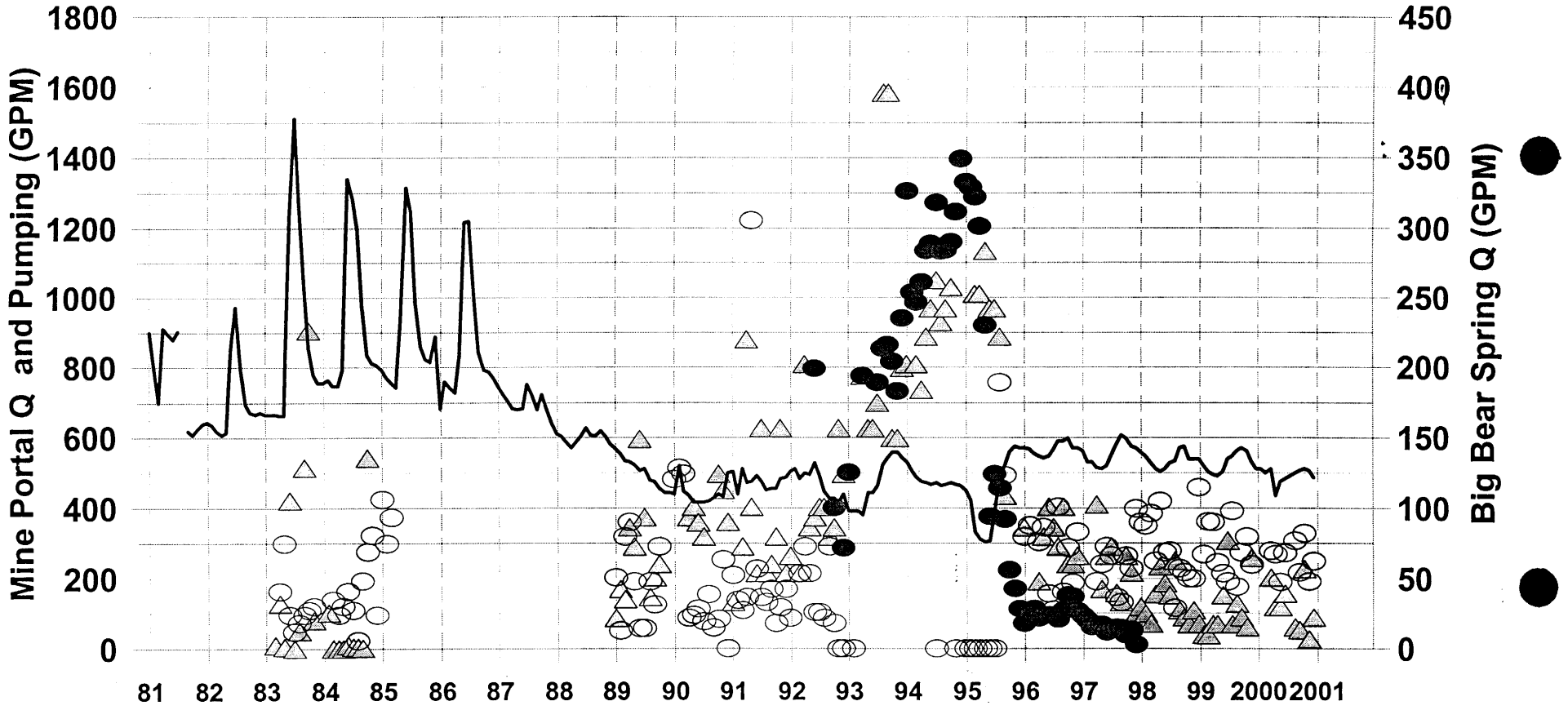


Figure 1

Figur 2

Hiawatha Mine Discharge

Graben Goose and Bear Canyon Springs



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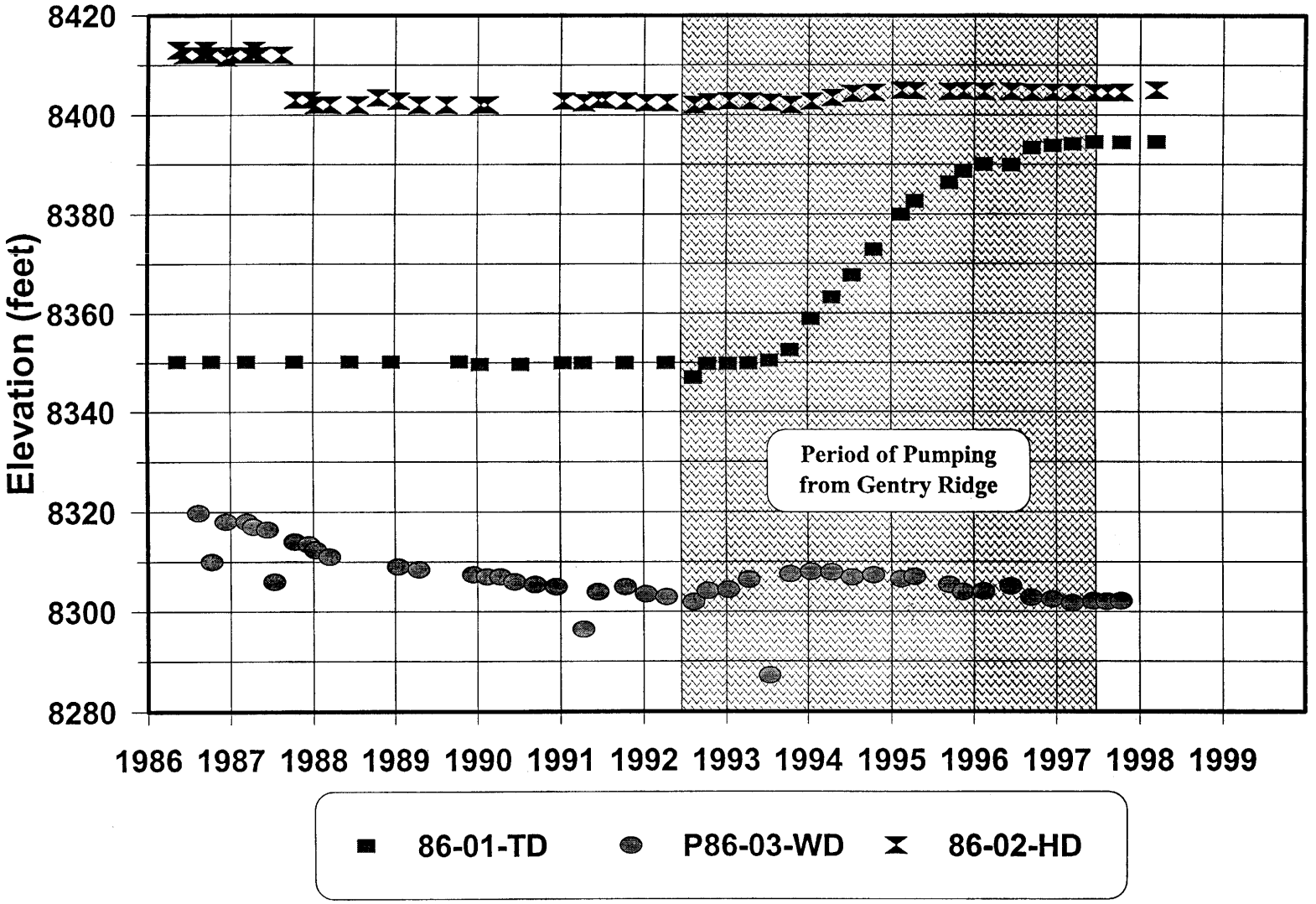
Star Point Wells

East of The Bear Canyon Fault



H:\QUATTRO\GentryMtn\Quattro\GNTRYMTC.WB2:WellBCF E

Figure 3

Star Point Wells: Gentry Ridge

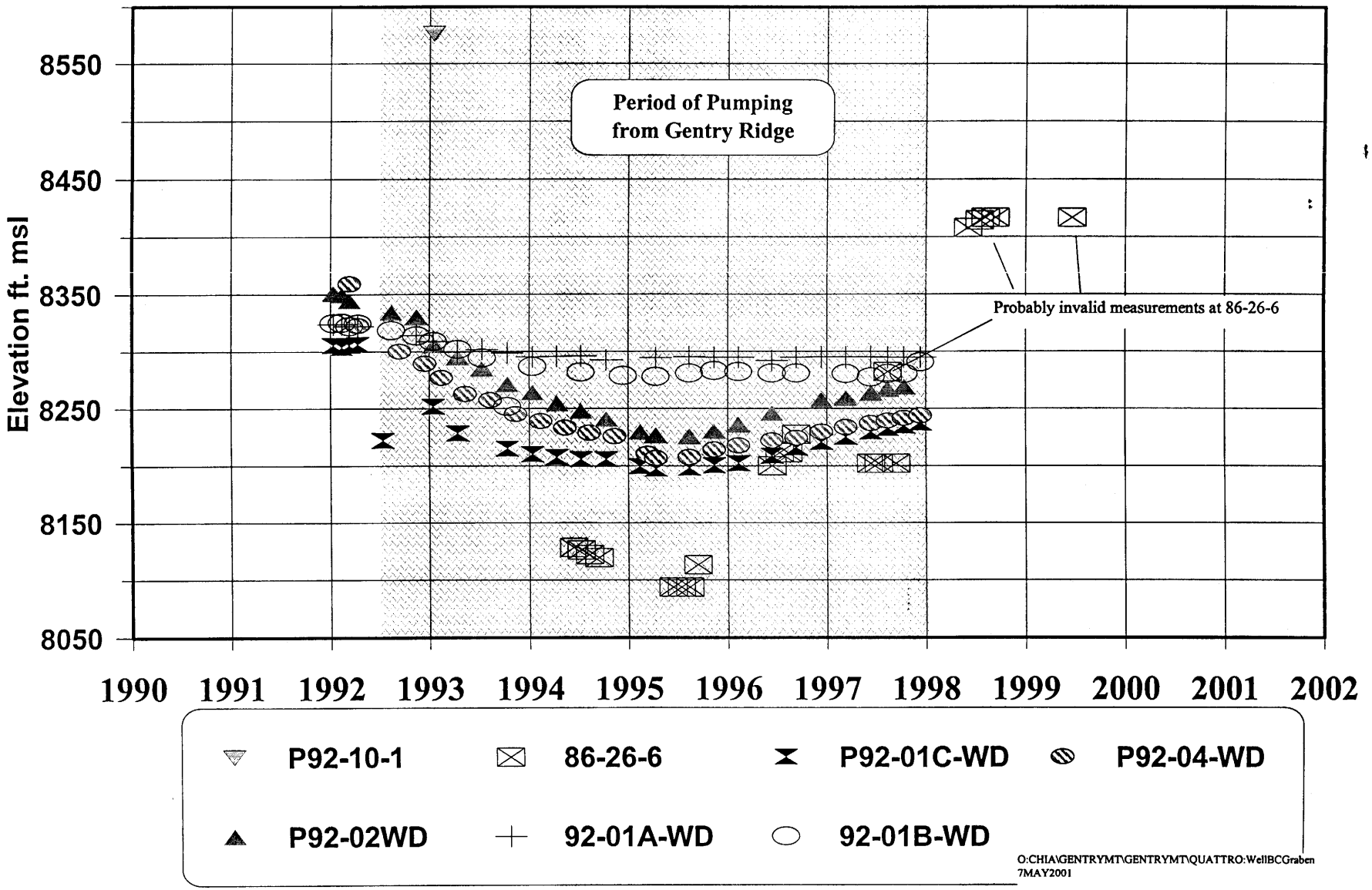
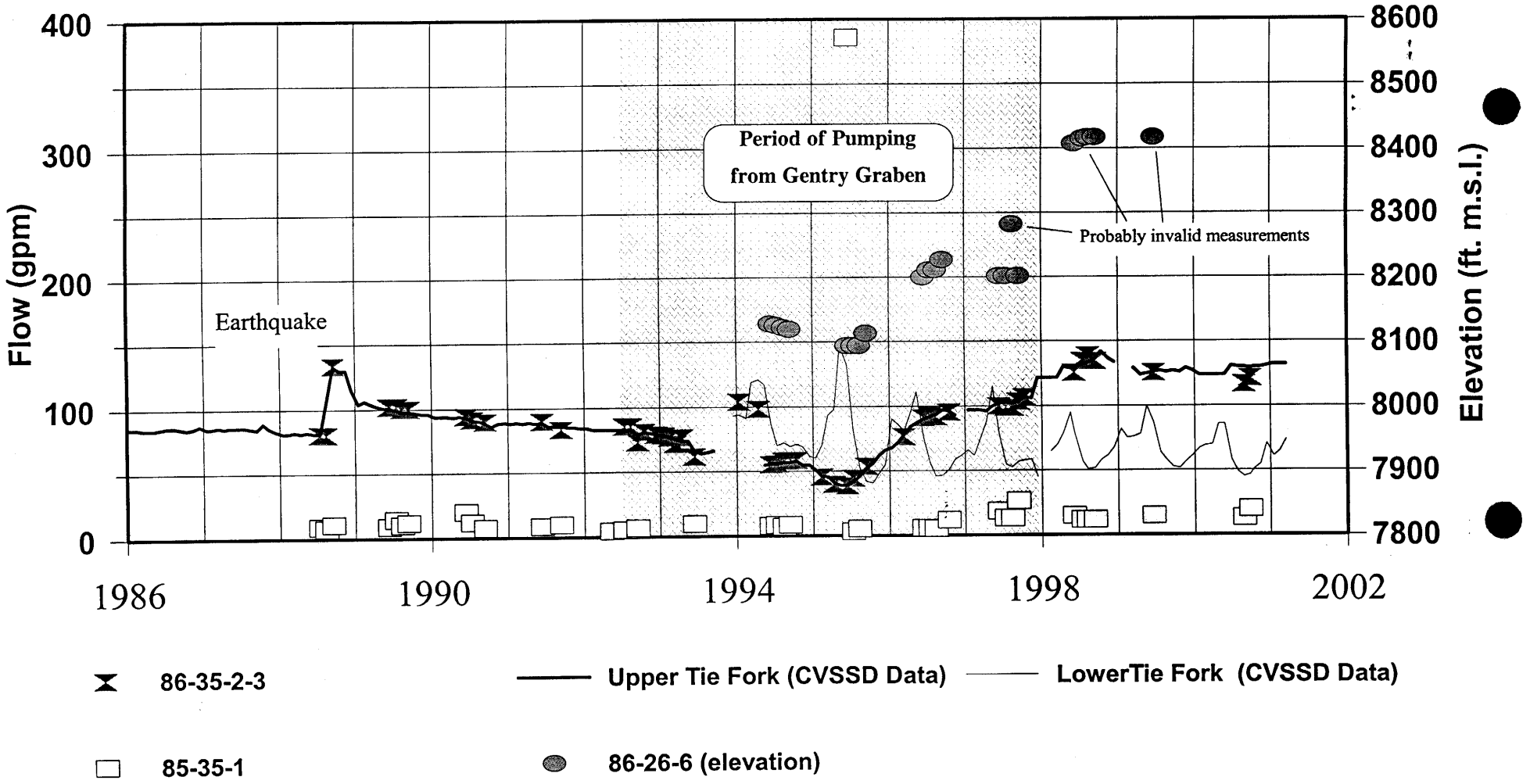


Figure 4

Figur

Tie Fork Wells

and Related Monitoring Sites



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Bear Canyon Mine

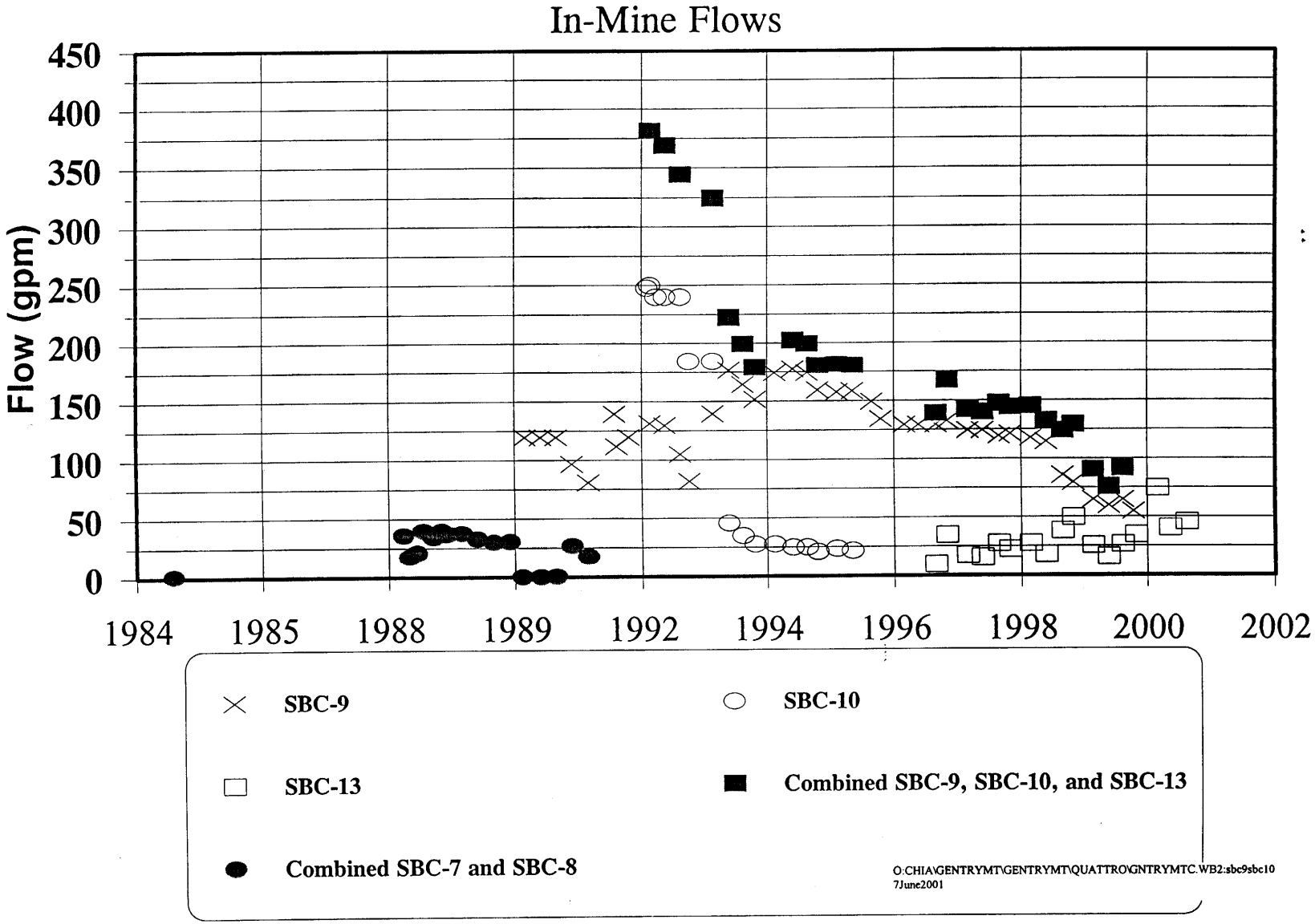


Figure 6

Bear Canyon In-Mine Drill Holes

Star Point Sandstone

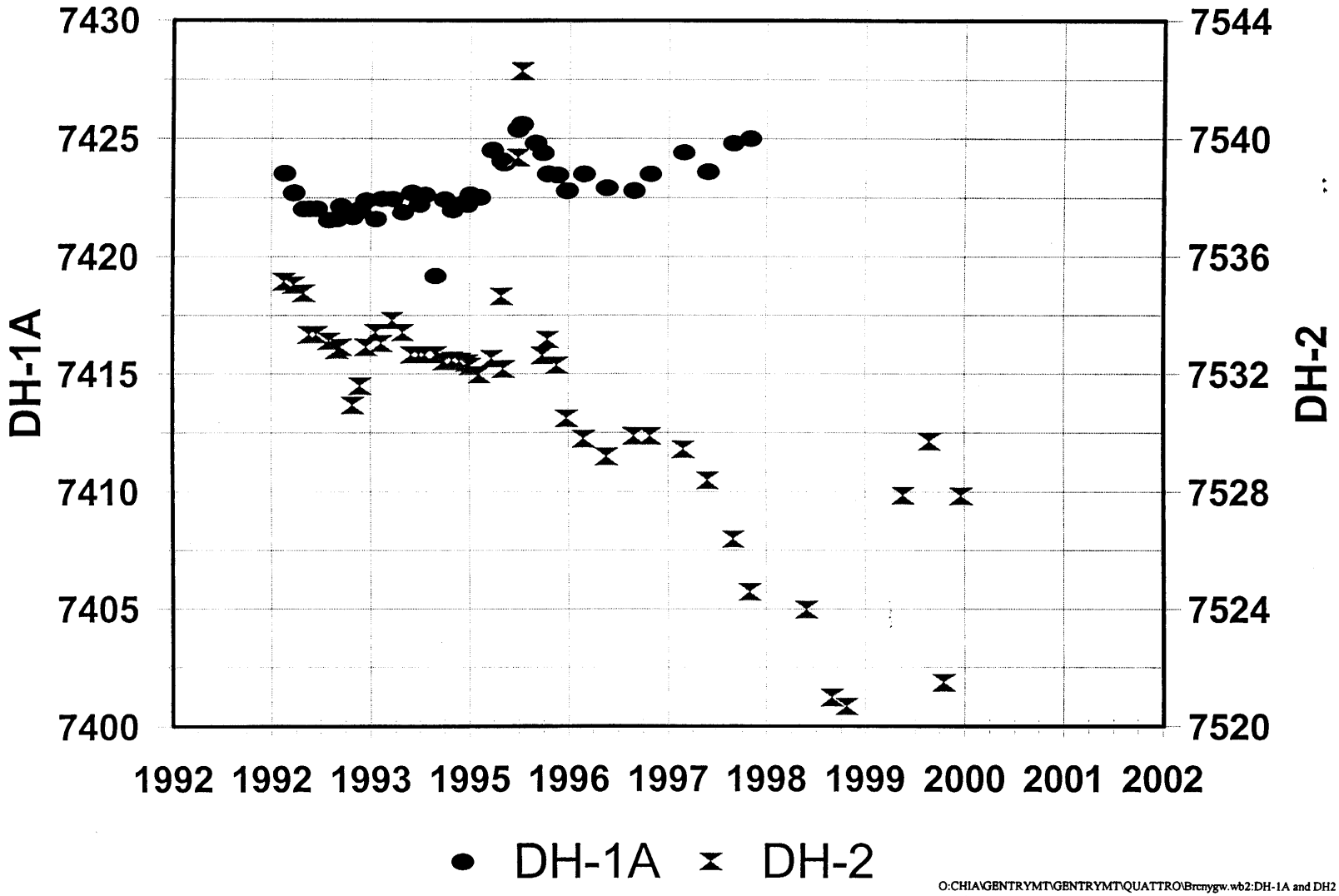
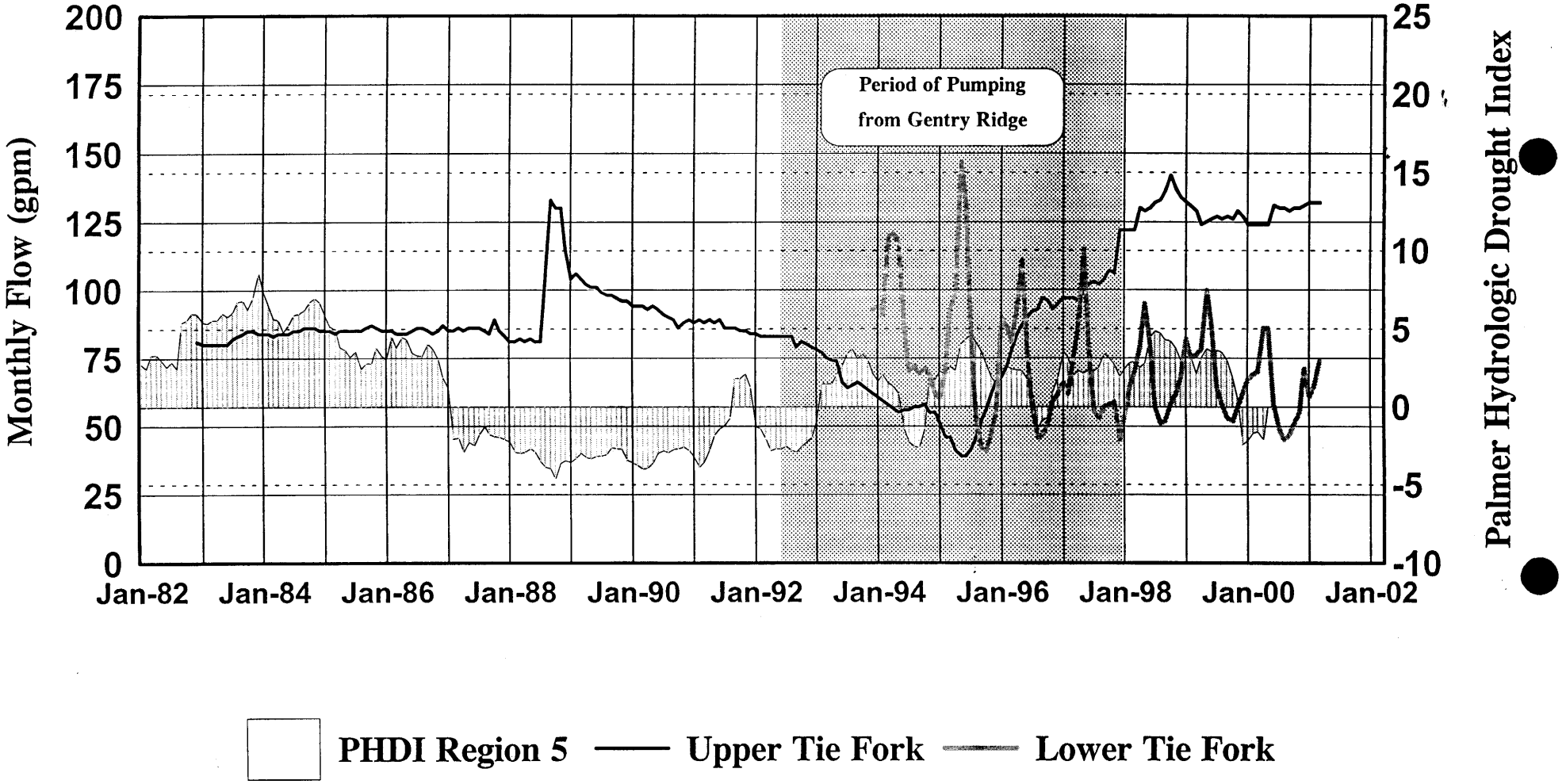


Figure 7

Tie Fork Springs and the Palmer Hydrologic Drought Index



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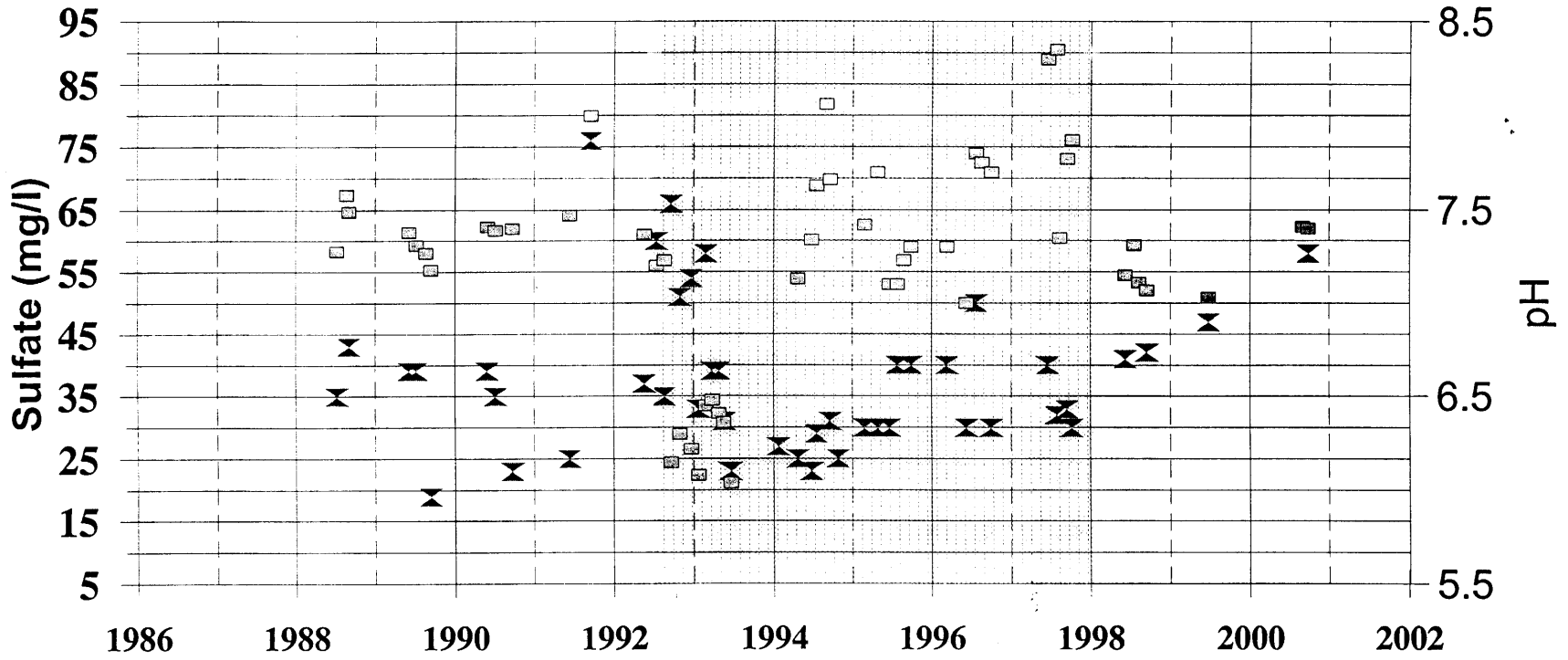
9MAY2001

Figure 8

Sulfate and pH

Upper Tie Fork Well 86-35-2-3



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9MAY2001

Figure 9

Bicarbonate and TDS

Upper Tie Fork Well 86-35-2-3

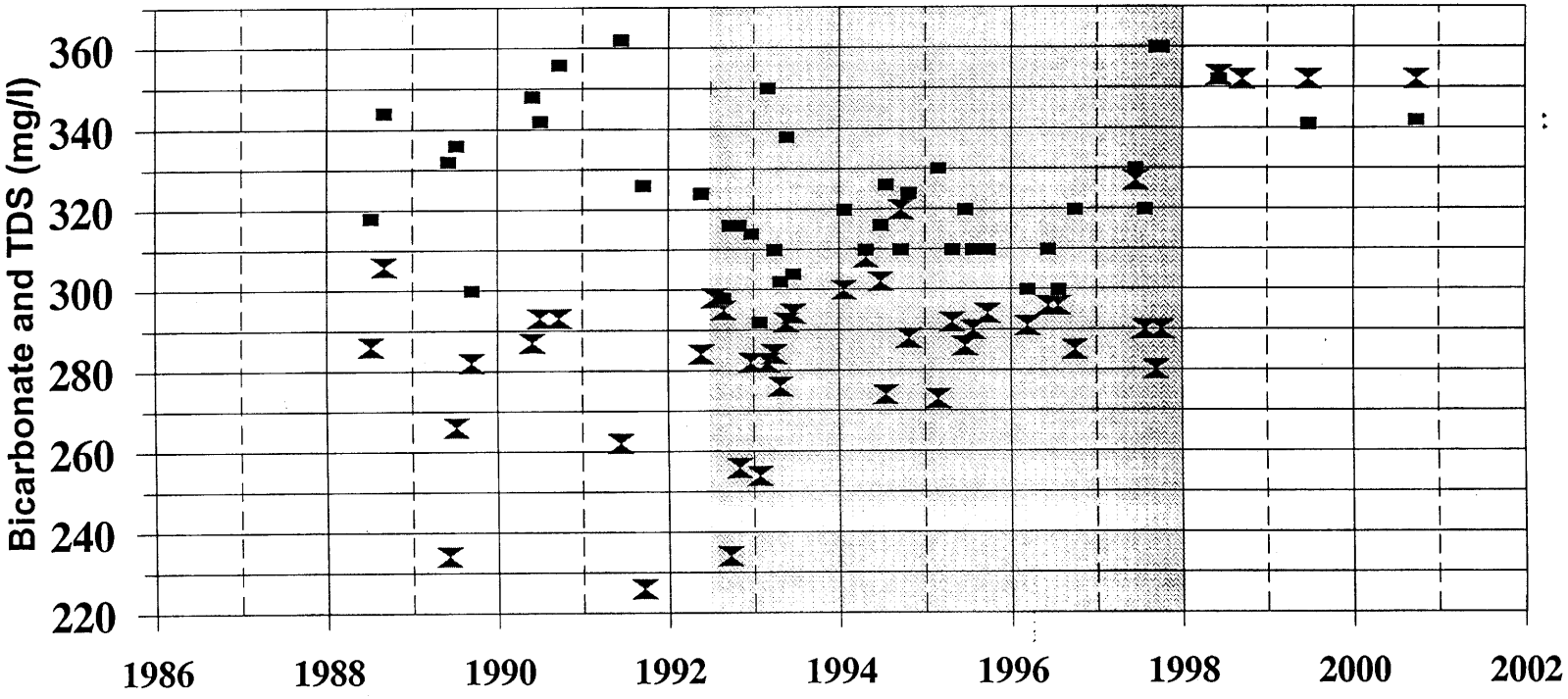

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Figure 10

Birch Spring Flow
Combined Data Sources

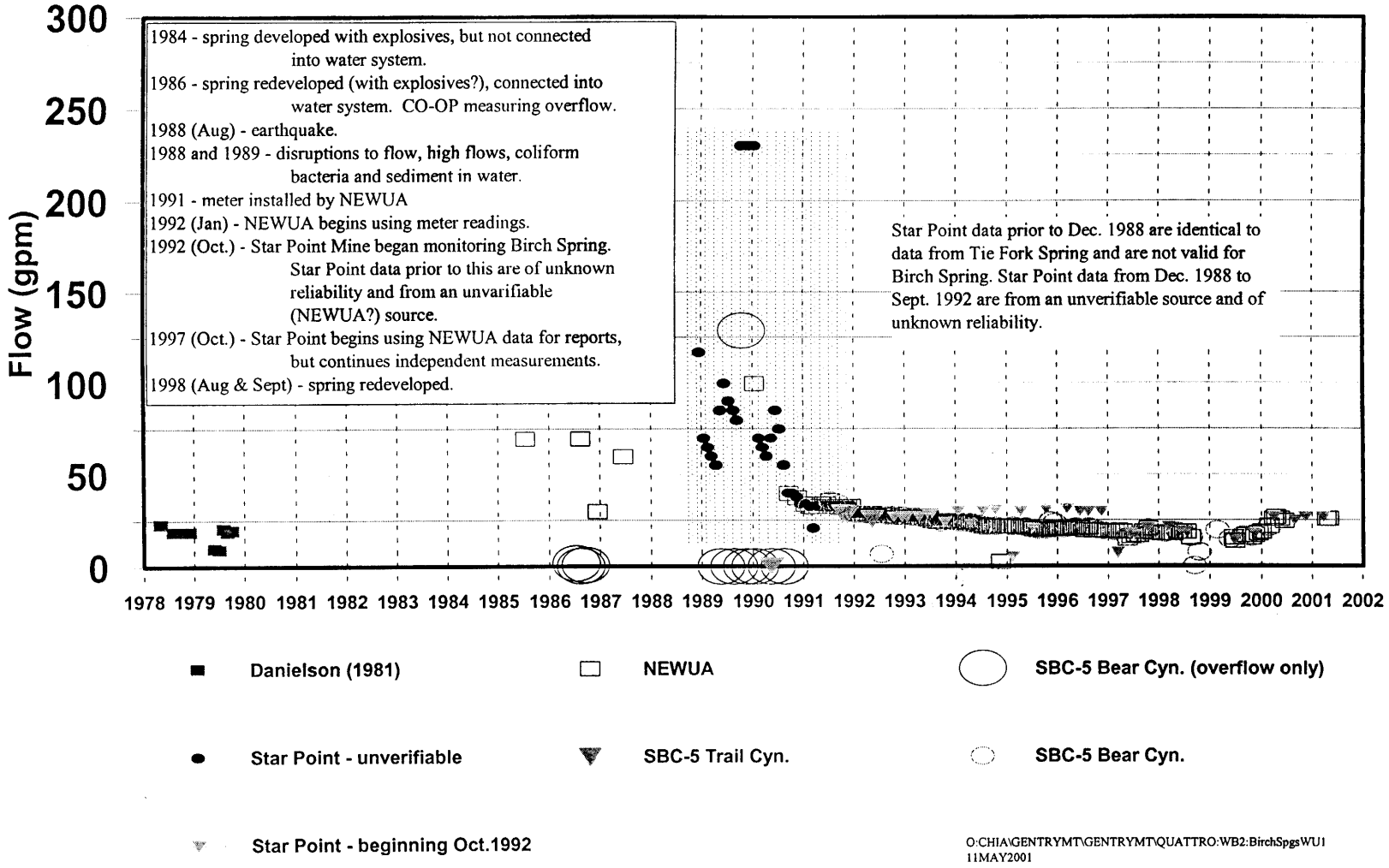

Figure 11a

Birch Spring Flow
Combined Data Sources

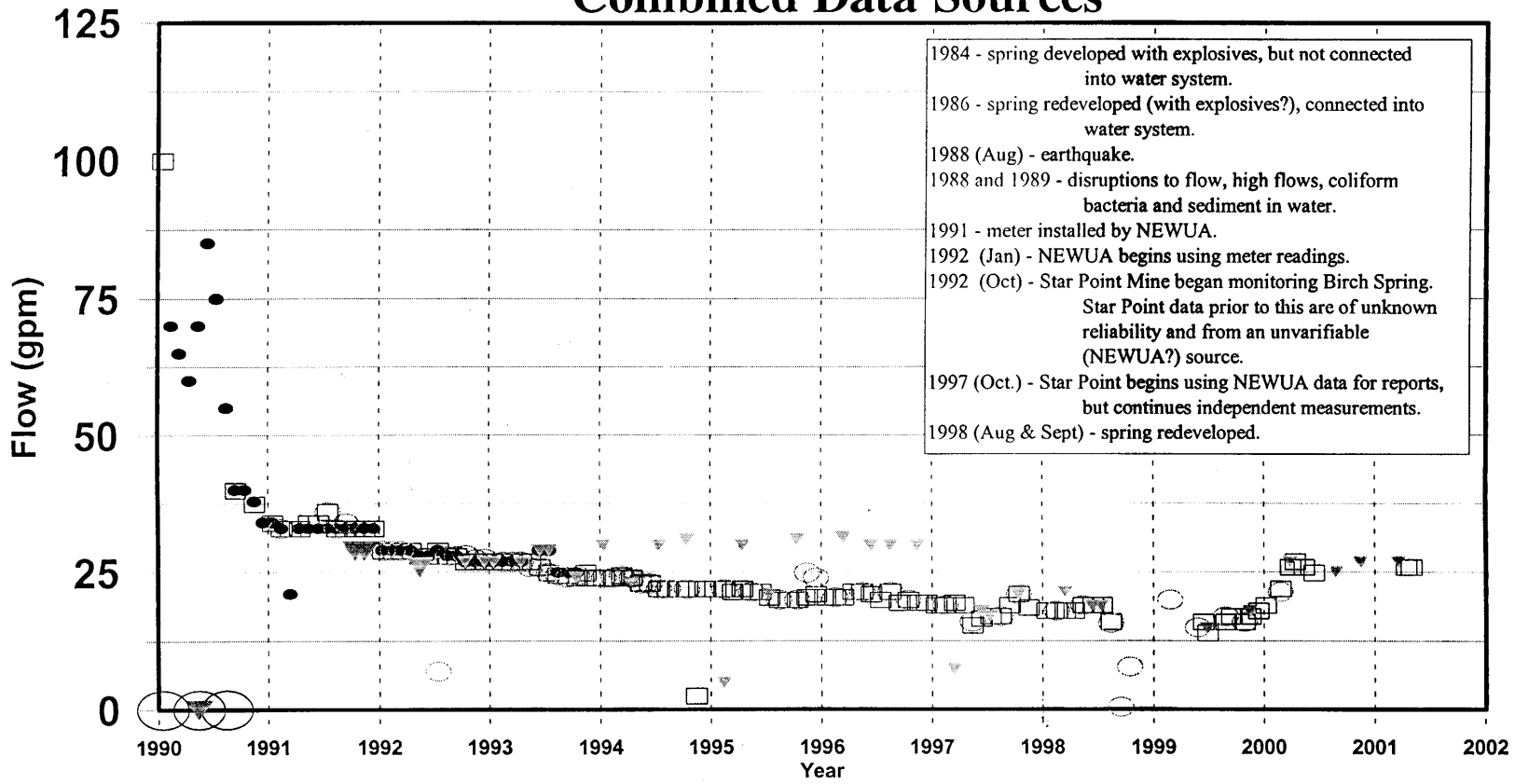

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Figure 11b

Chemistry of SBC-9

Sand Channel

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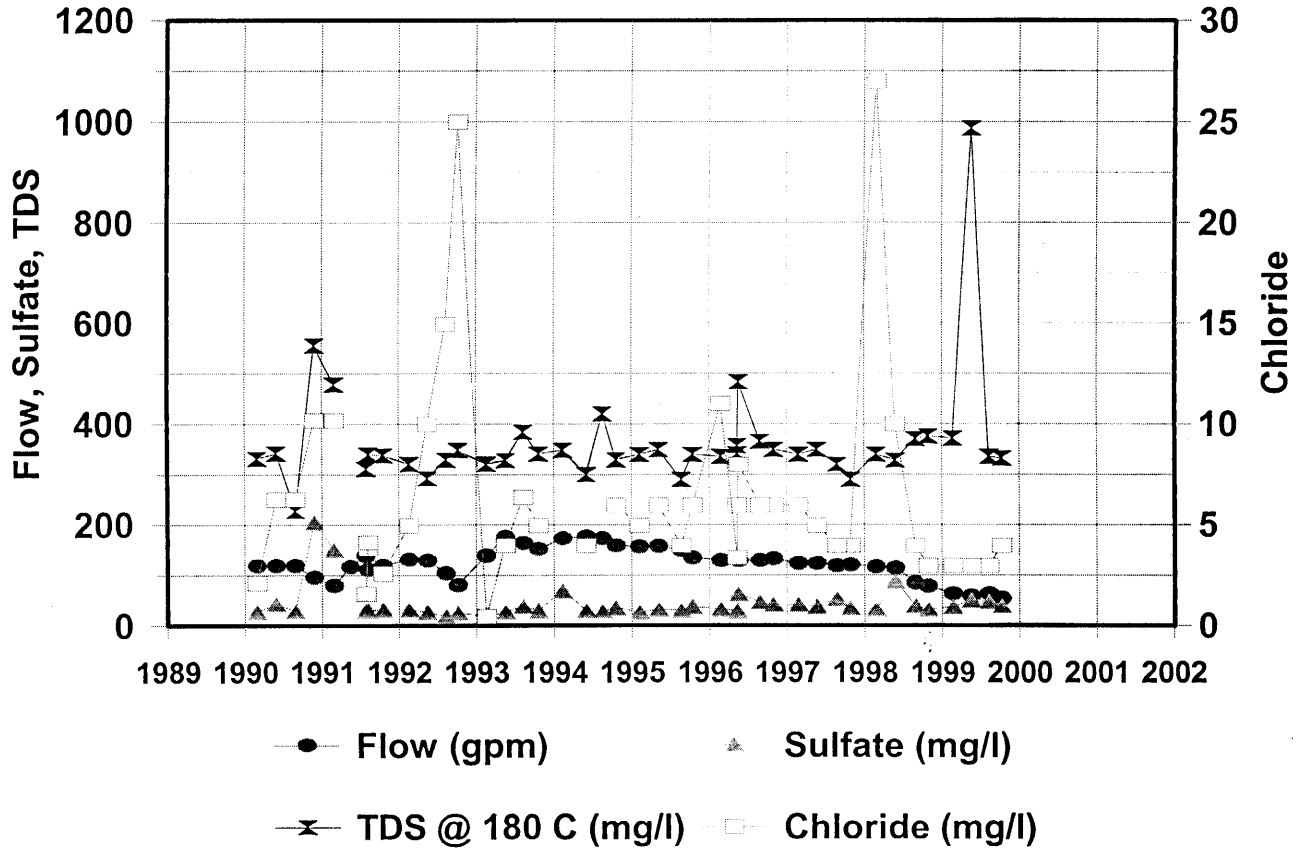

Figure 12

Chemistry of SBC-10

Sand Channel

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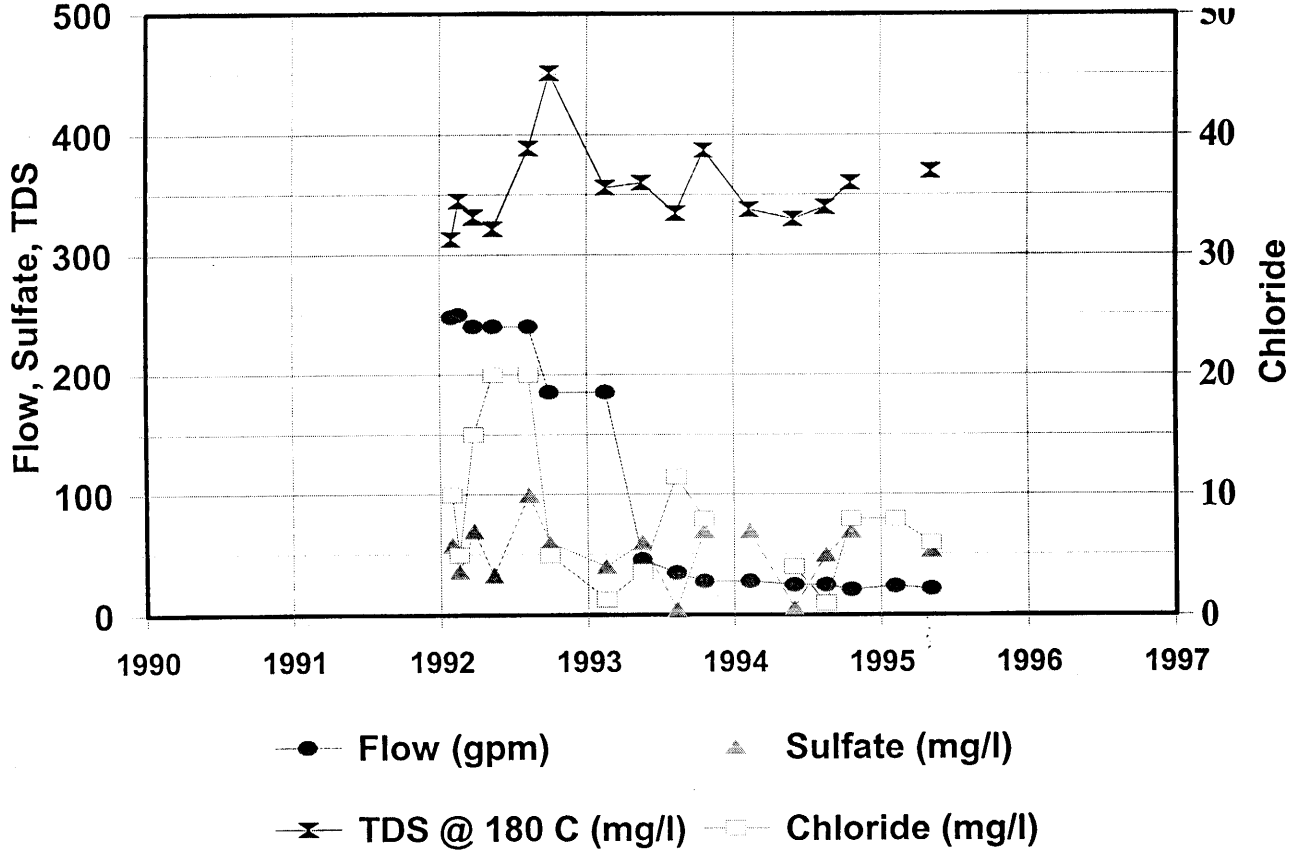

Figure 13a

Chemistry of SBC-13

Sand Channel

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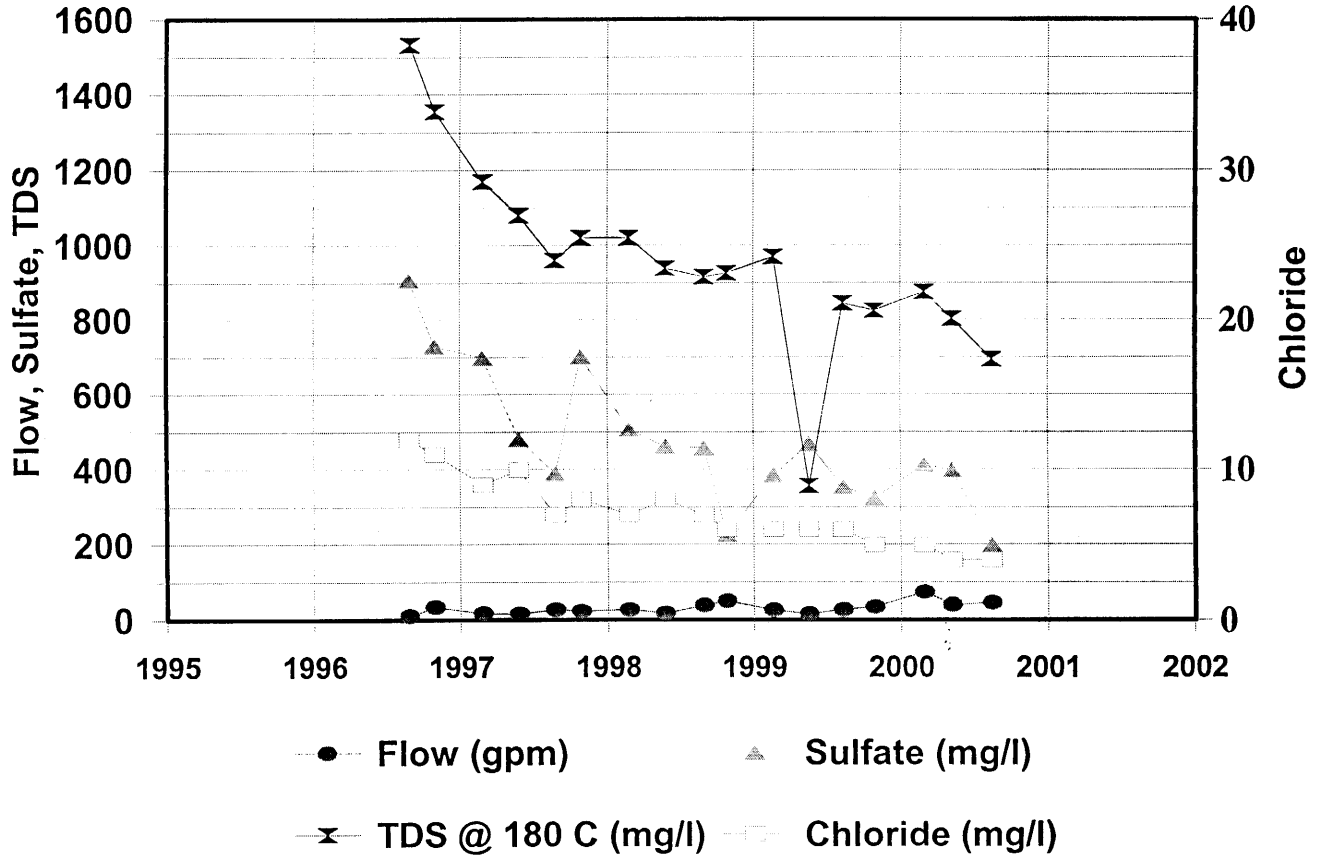


Figure 13b

Flow of Selected Springs and Region 5 PHDI

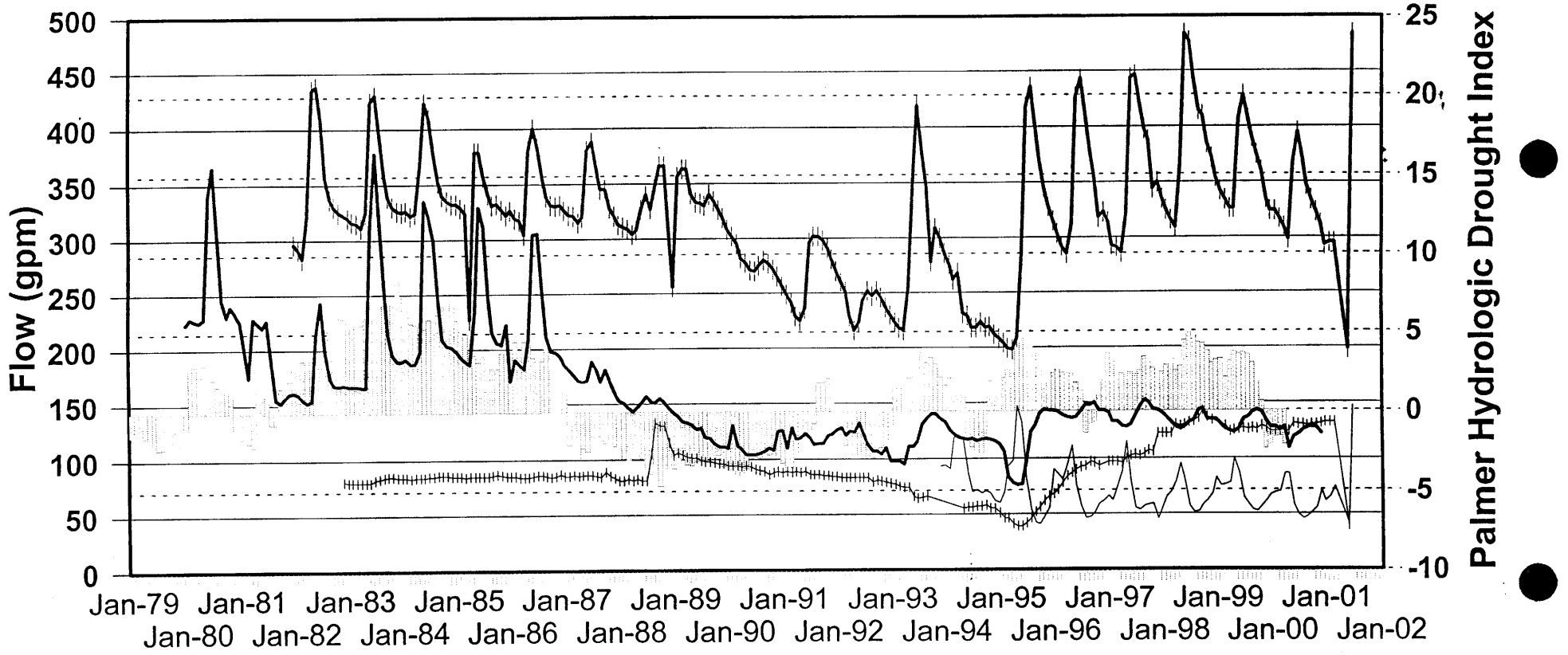
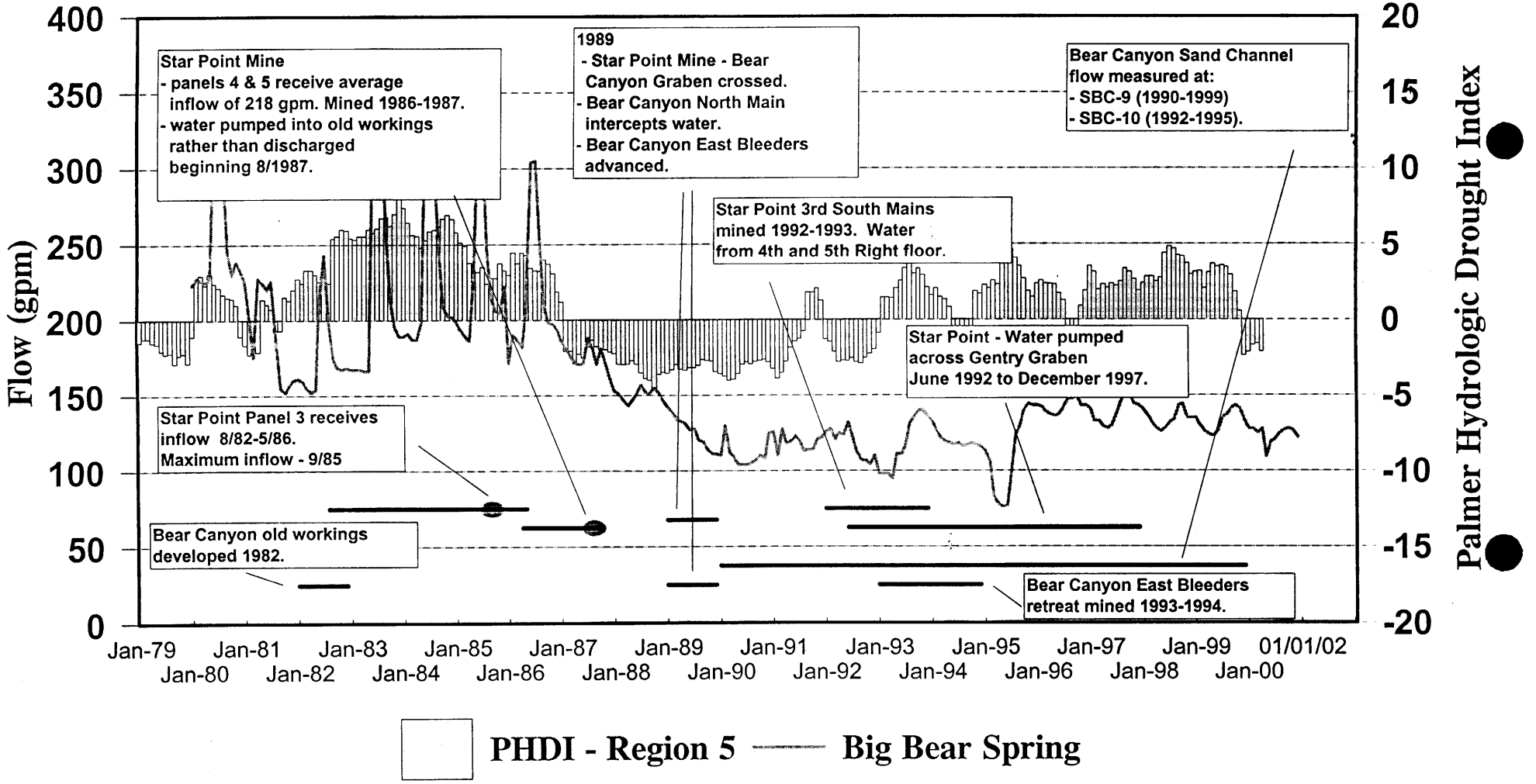


Figure 14a

Big Bear Spring, the PHDI, and Mine Water Interception



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16MAY2001

Figure 14b

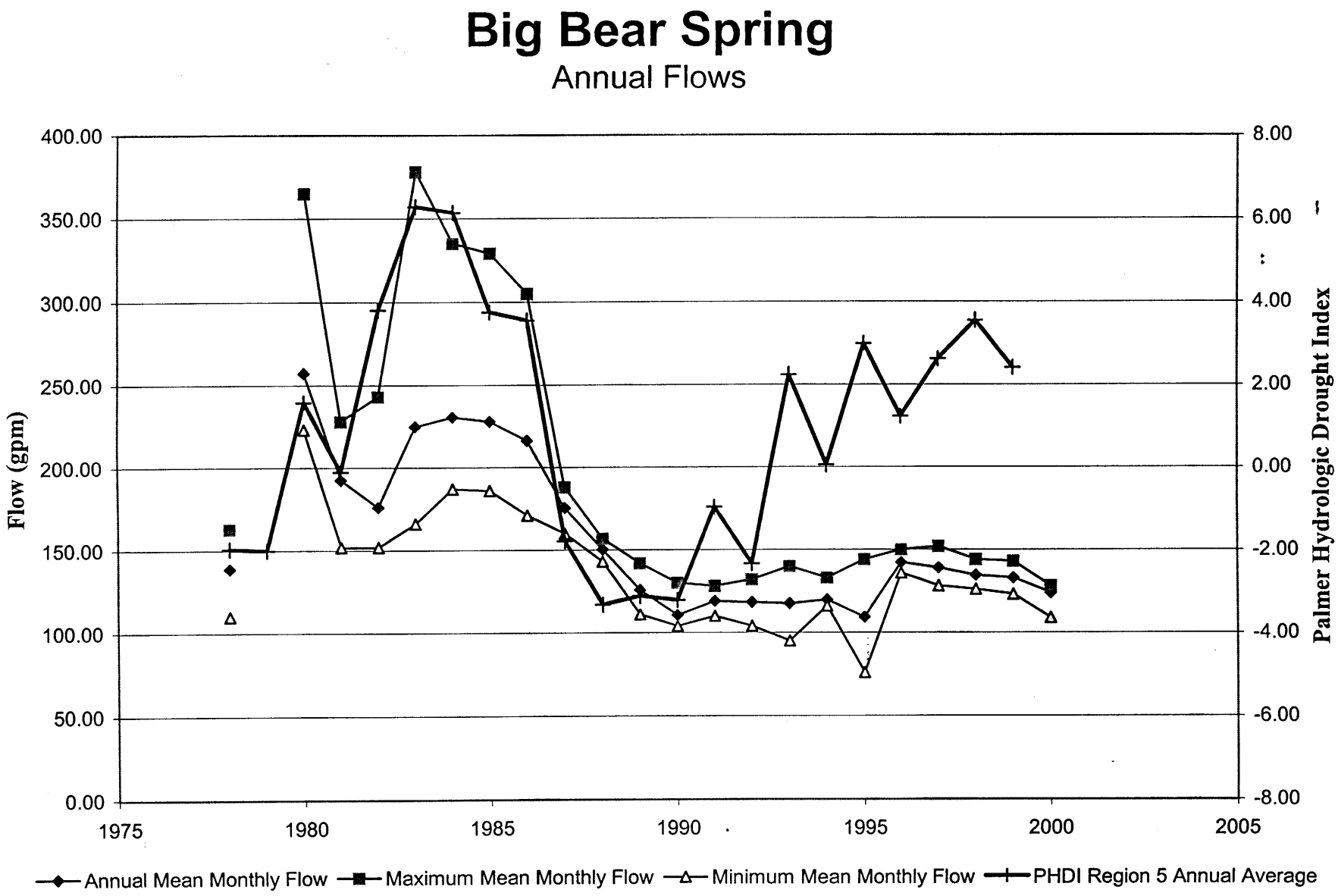
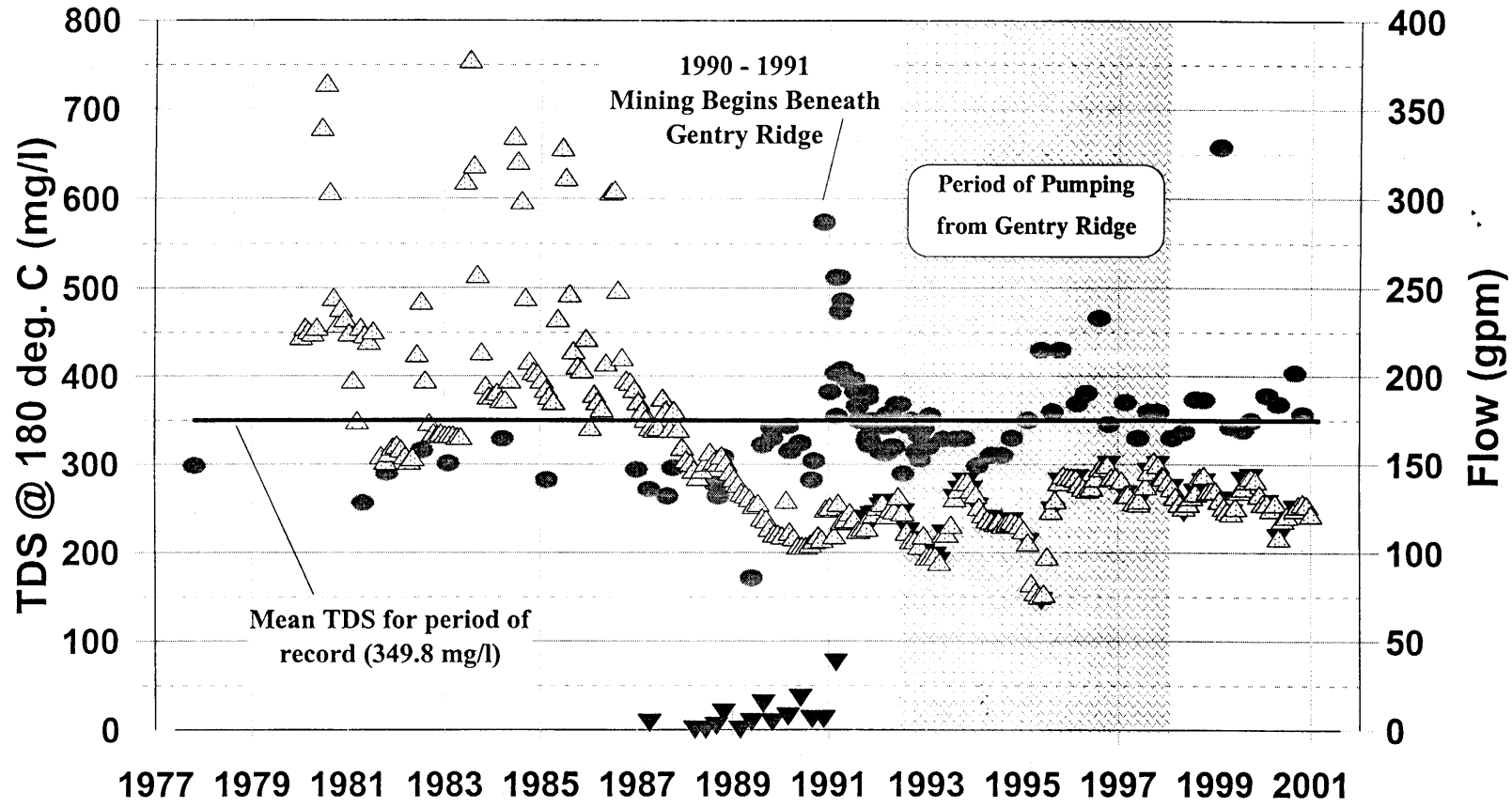

Big Bear Spring
Annual Flows
Flow (gpm)
Palmer Hydrologic Drought Index
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
1975
1980
1985
1990
1995
2000
2005
Annual Mean Monthly Flow
Maximum Mean Monthly Flow
Minimum Mean Monthly Flow
PHDI Region 5 Annual Average

Figure 15

Bear Canyon Mine: Big Bear Spring

Total Dissolved Solids (TDS) vs Time



● TDS

▼ Bear Canyon Mine Discharge

△ Big Bear Spg Avg. Monthly Flow

O:CHIA\GENTRYMT\GENTRYMT\QUATTRO\GNTRYMTC.WB2:bbTDSvsTIME
29MAY2001

Figure 16a

Bear Canyon Mine: Big Bear Spring

Total Dissolved Solids (TDS) vs Flow

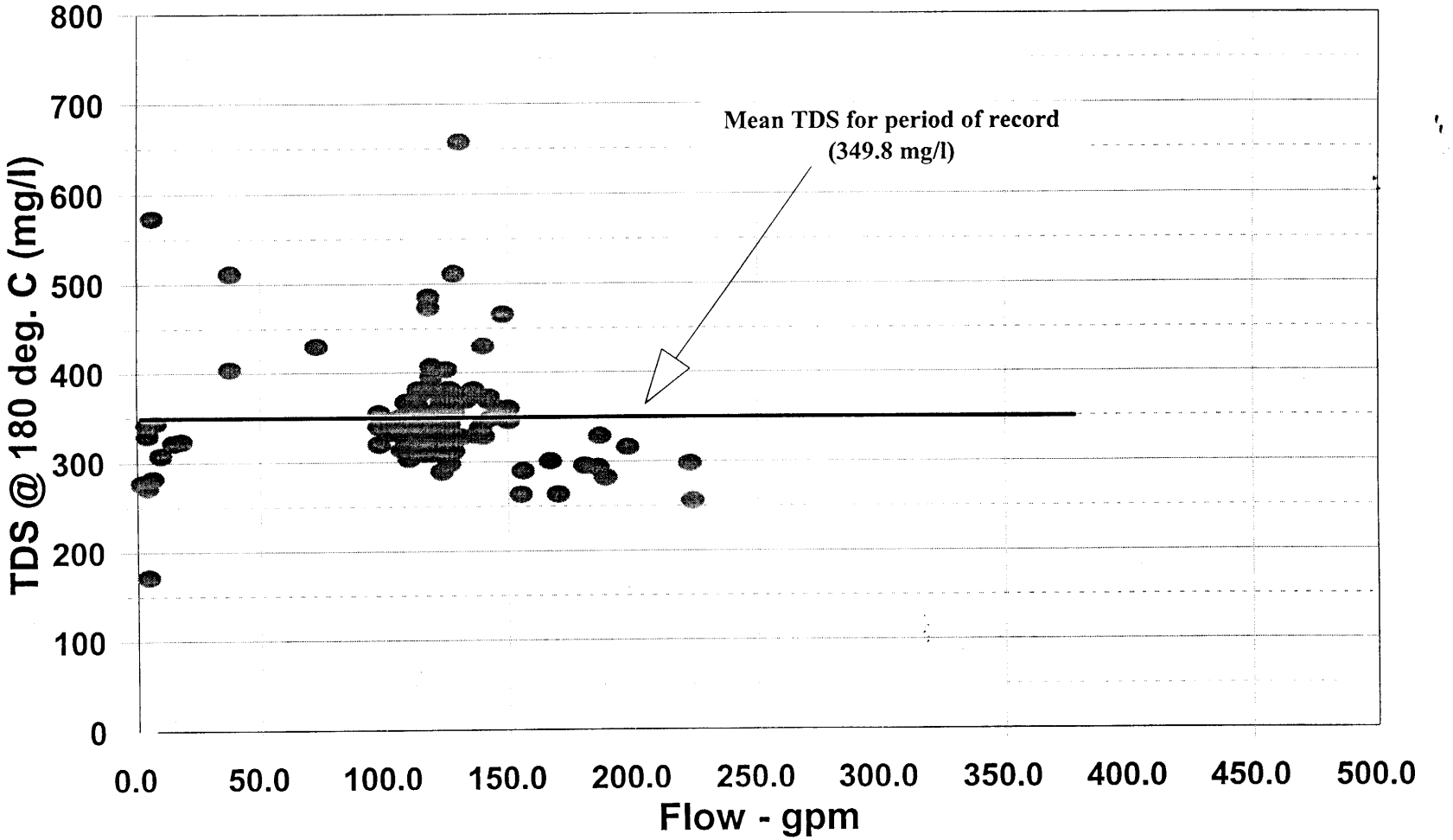


Figure 16b

Meteoric Water Line
Deuterium and Oxygen 18

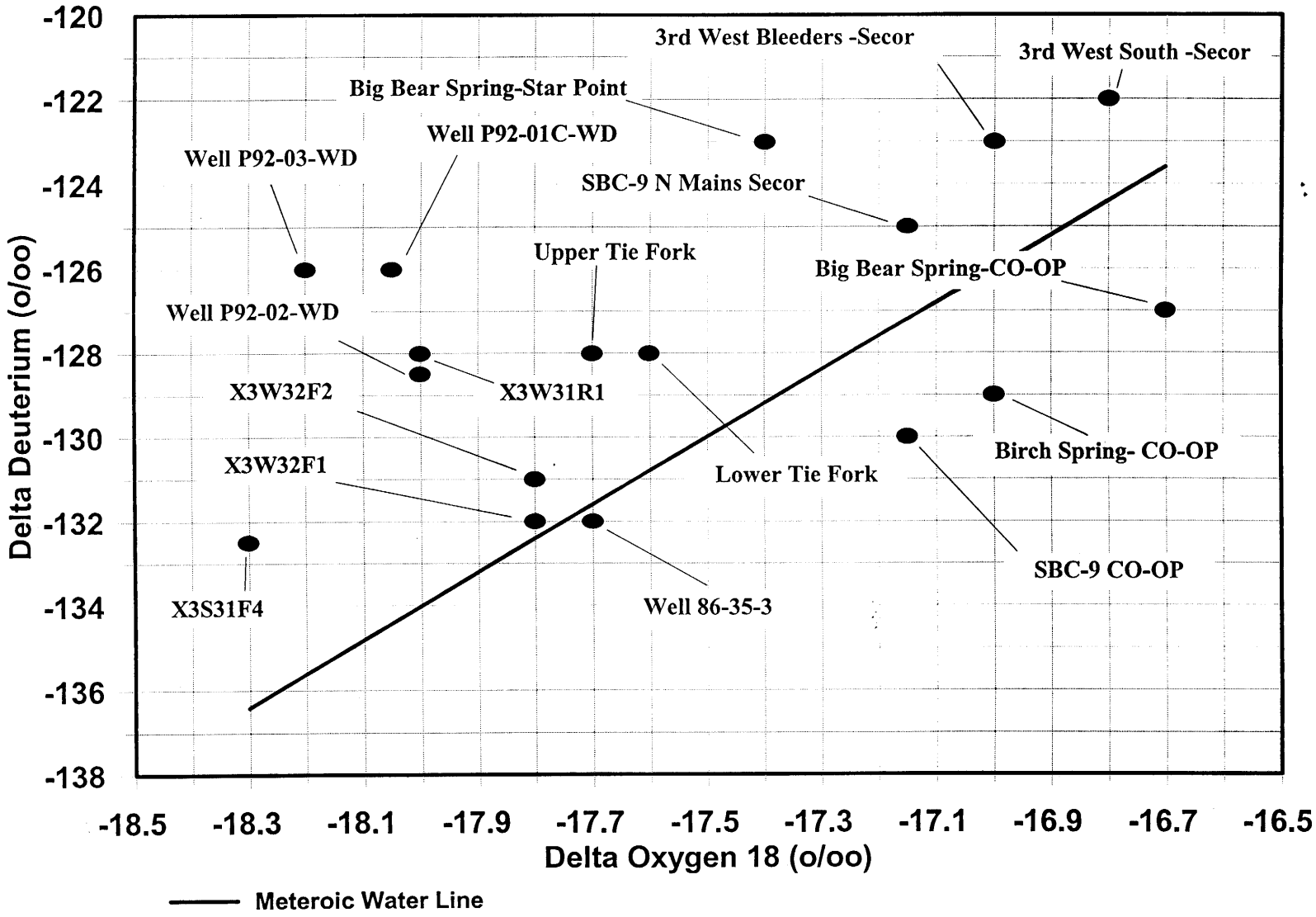


Figure 17

Bear Canyon Mine & Bear Creek Flows

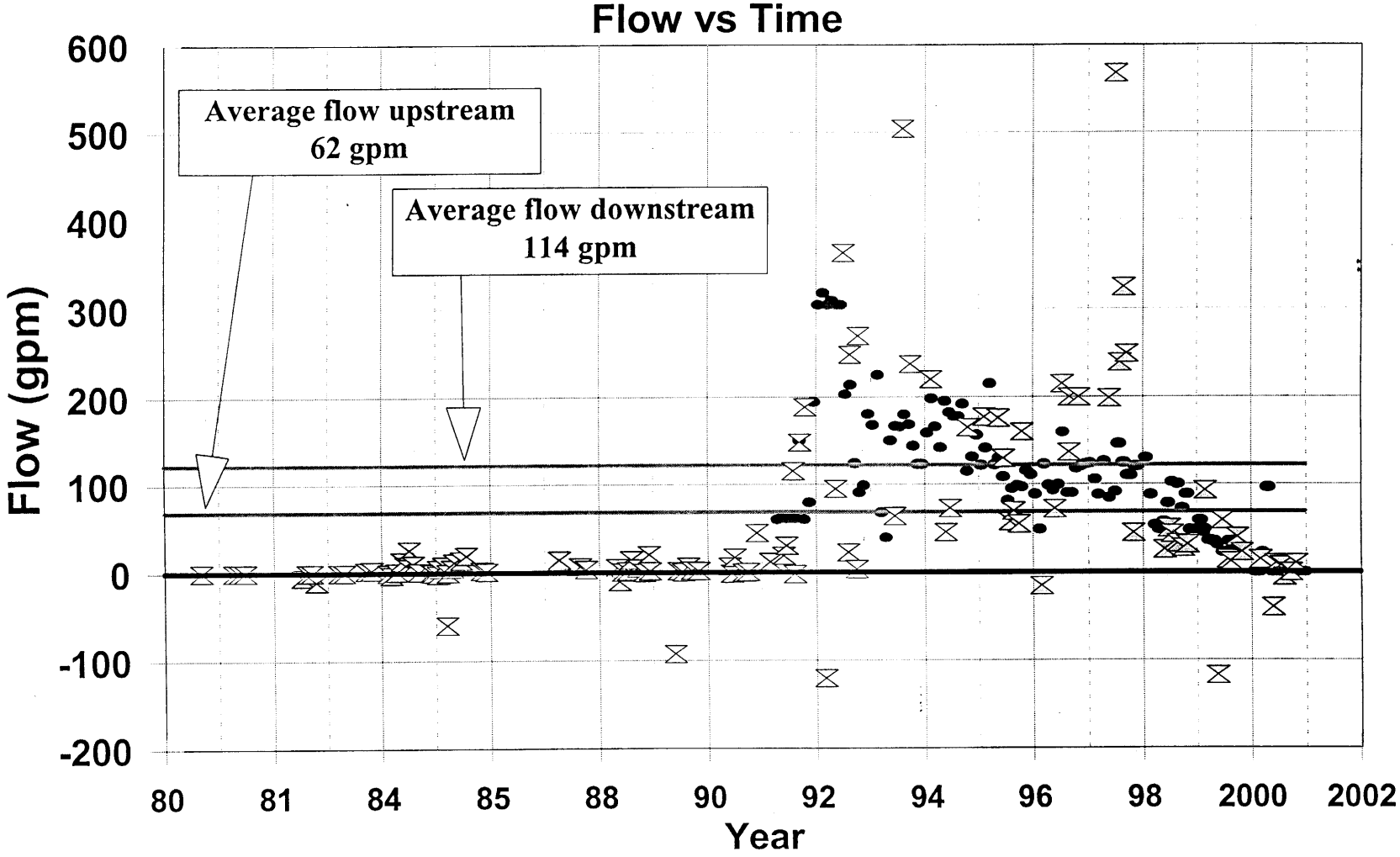


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Figure 18

Bear Canyon Mine & Bear Creek Flows

Flow vs Time

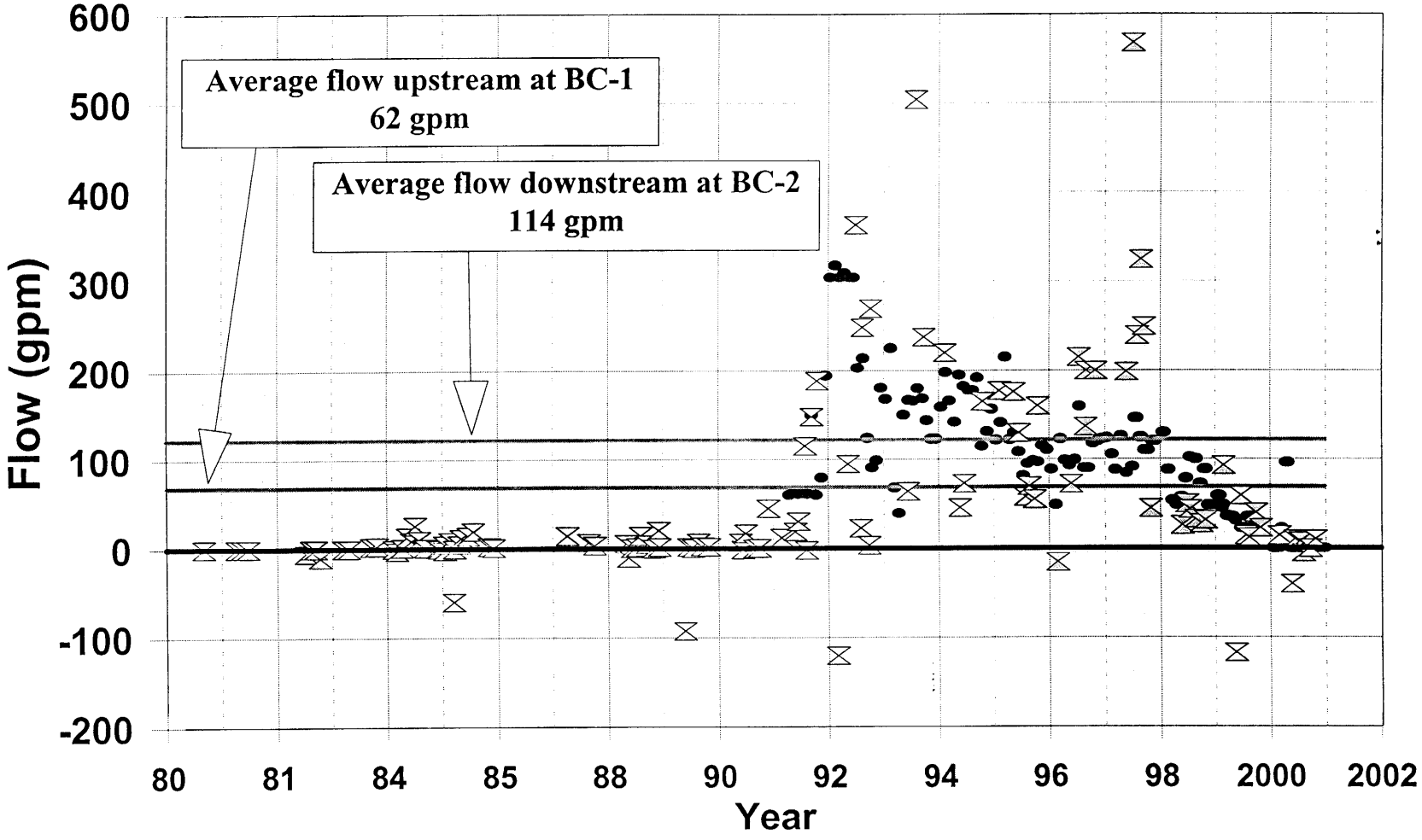

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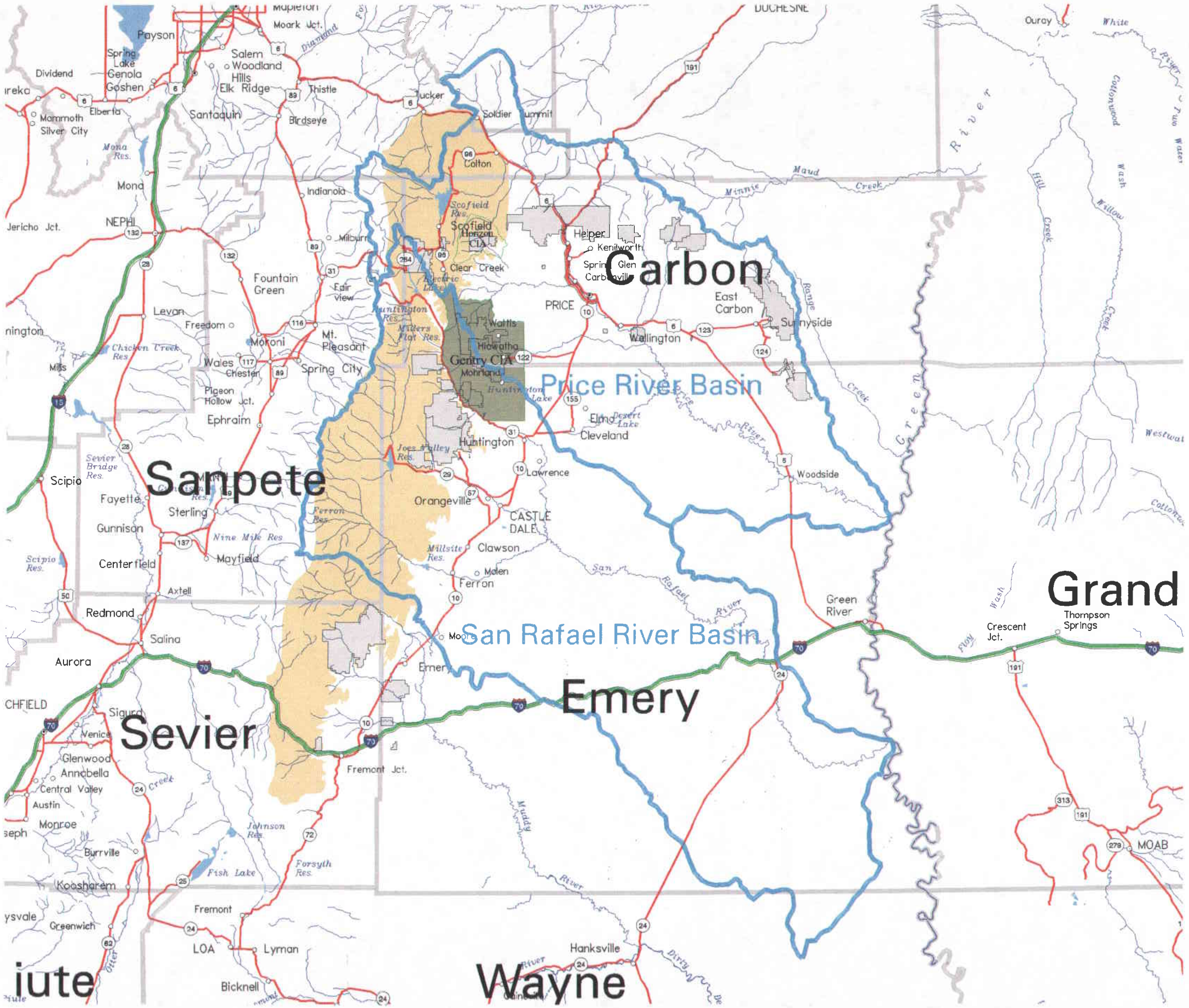
Figure 18

APPENDIX B.

CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT MAPS

Map 1:	Gentry Mountain CHIA Location Map
Map 2:	Cumulative Impact Area (CIA)
Map 3:	Star Point and Hiawatha Mining & Subsidence Areas
Map 4:	Bear Canyon & Trail canyon Mining & Subsidence Areas
Map 5:	Gentry Mountain Geology
Map 6:	Gentry Mountain CHIA surface Hydrology


Carbon
Price River Basin
Sanpete
San Rafael River Basin
Emery
Grand
Sevier
Wayne
Duchesne
Uintah
Payson
Spring Lake
Genola
Goshen
Dividend
Mammoth
Silver City
Elberta
Santaquin
Salem
Woodland Hills
Elk Ridge
Thistle
Birdseye
Tucker
Soldier Summit
Colton
Scofield Res.
Scofield
Horizon CIA
Helper
Kenilworth
Spring Glen
Carbonville
Clear Creek
Indianola
Milburn
Mona
Mona Res.
Jericho Jct.
NEPHI
Fountain Green
Fair view
Levan
Freedom
Mt. Pleasant
Mokoni
Wales
Chester
Spring City
Pigeon Hollow Jct.
Ephraim
Mills
Chicken Creek Res.
Huntington Res.
Millers Flat Res.
Wattis
Hiawatha
Gentry CIA
Mohrland
Huntington Lake
PRICE
East Carbon
Sunnyside
Wellington
Elmo
Desert Lake
Cleveland
Huntington
Joes Valley Res.
Lawrence
Orangeville
CASTLE DALE
Clawson
Millsite Res.
Molen
Ferron
Ferron Res.
Nine Mile Res
Mayfield
Sterling
Gunnison
Centerfield
Axtell
Redmond
Salina
Aurora
Sigurd
Venice
Glenwood
Annabella
Central Valley
Austin
Monroe
Burrville
Koosharem
Fish Lake
Johnson Res.
Forsyth Res.
Fremont
Greenwich
LOA
Lyman
Bicknell
Fremont Jct.
Emery
Green River
Crescent Jct.
Thompson Springs
Hanksville
MOAB
Scipio
Scipio Res.
Sevier Bridge Res.
Maud Creek
Minnie Maud Creek
Hill Creek
Willow Creek
Range Creek
Green River
White River
Ouray
Westwater
Location Map
Wasatch Coal Field
Coal Permit Areas
Gentry Mountain CIA Area
County Boundary
CIA Areas
Hydrologic Unit Boundary
State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
Map 1
Cumulative Hydrologic Impact Assessment
Gentry Mountain Mine
LOCATION MAP
File: map1.gra
Compiled by: Dan Smith Date: June 04, 2001

T14S R7E

T14S R8E

T15S R7E

T15S R8E

T16S R8E

T16S R7E

Star Point Mine

Hiawatha Complex

Huntington Canyon #4 Mine

Bear Canyon Mine

Trail Canyon Mine

Deer Creek Mine

First Water Canyon

Gordon Creek

North Fork

Corner Canyon

Los Angeles Cyn

Mud Water Cyn

Nuck Woodward

South Fork

Smiley Canyon

Little Park Cyn

Service Berry Creek

McElphraing Cyn

Vicks Cyn

Grange Hole

Biddlecomb Cyn

Wildcattle Hollow

Gentry Ridge

Gentry Hollow

Hoog Ridge

Right Fork

Middle Fork

Miller Creek

Tie Fork Cyn

Upper Tie Fork

Little Bear Creek

Trail Canyon

McCadden Hollow

Left Fork Miller Creek

Mill Fork

Huntington Creek

Fish Creek

Pole Cyn

CIA Area

Intermittent Stream

Perennial Stream

Lease Boundary

Contours 200ft Interval

Main Road

Graded Dirt Road

Dirt Road

Map 2
Cumulative Hydrologic Impact Assessment
Gentry Mountain Mine

CUMULATIVE IMPACT AREA (CIA)

File: map2.gra

Compiled by: Dan Smith Date: June 04, 2001

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

N

Scale 1:50000 (verify scale)

Location Map

Star Point Mine

Hiawatha Portals

King Portals

Hiawatha Complex

Mohrland Portals

Hiawatha #2 Mine Water Storage Reservoir

Graben Tunnel

Shattered Zone

Carbon Co.

Emery Co.

U037045

U064263

SL0031286

SL0031286

U007949

U051923

U0026583

U013095

SL0069985

SL0069985

SL0025431

SL0025431

U061048

U046484

U061049

U0024316

R7E

T15SR8E

T16SR8E

Area 10

Area 9

Area 8

Area 15

Area 13

Longwall mining panels 3,4,5

Longwall mining panel 12

Longwall mining panels 4,5

Pleasant Valley Graben

Trail Cyn Fault (East Fault of Pleasant Valley Graben)

Bear Canyon Graben

Western Boundary Fault Bear Cyn Graben

Bear Canyon Fault

Wildcattle Hollow

Gentry Ridge

Trail Canyon Fault

Dry Canyon Fault

Subsidence or break out areas

Mined Areas

Selected Long Wall Mining Panels

Mined Mains

Wattis Seam Sump Drainage Area

Third Seam Sump Drainage Area

Streams

Major Faults

Infered Major Faults

Minor Faults

Infered Minor Faults

Subsidence Fractures

Springs

Wells

Surface Water Monit. Site

Underground Water Monit. Site

UPDES Monit. Site

Map 3
Cumulative Hydrologic Impact Assessment
Gentry Mountain Mine

Star Point & Hiawatha Mining and Subsidence Areas

File: map3.gra

Compiled by: Dan Smith Date: June 04, 2001

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

N

0 1/4 1/2 1 2 mi
0 1000 5000 10,000 ft
0 1/2 1 3 k

Scale 1:55000 (verify scale)

Location Map

U046484

U061049

U0024316

U038727

U0020668

Trail Canyon Fault

Dry Canyon Fault

Pleasant Valley Fault

Blind Canyon Fault

Bear Canyon Fault

Trail Canyon Mine

Bear Canyon Mine

Trail Canyon Fan Portal

Intake & Belt Portal

Intake Portal

Fan Portal

Tank Seam Portals

Portal Entrys

Belt Portal

Intake Portal

Portal Entry

Bear Canyon Seam Portal

3rd West Bleeder

Sandstone Channel

10 11 12 7 15 14 13 18 22 23 24 19 27 26 25 30 34 35 36 31

- Subsidence or break out areas
- Mined Areas
- Blind Canyon Seam
- Hiawatha Seam
- Tank Seam
- Trail Canyon
- Streams
- Major Faults
- Infered Major Faults
- Minor Faults
- Infered Minor Faults
- Floor Seeps
- Springs
- Wells
- Surface Water Monit. Site
- Underground Water Monit. Site

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

N

0 1/4 1/2 1 mi
0 1000 2000 5000 ft
0 1/4 1/2 1 k

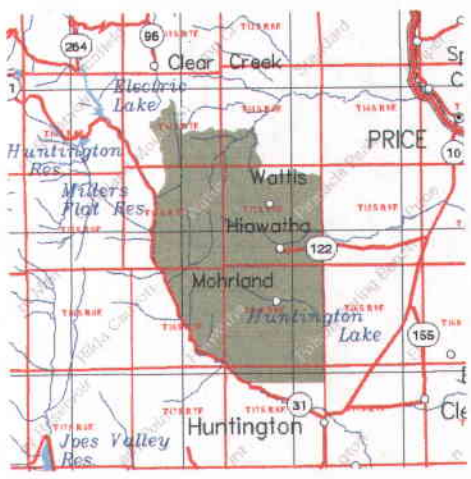
Scale 1:25000 (verify scale)

Map 4
Cumulative Hydrologic Impact Assessment
Gentry Mountain Mine

Trail Canyon & Bear Canyon Mining and Subsidence Areas

File: map4.gra

Compiled by: Dan Smith Date: June 04, 2001



Location Map

T14S R8E

T14S R7E

T15S R8E

T15S R7E

T16S R8E

T16S R7E

T1

Star Point Mine

Hiawatha Complex

Huntington Canyon #4 Mine

Bear Canyon Mine

Deer Creek Mine

S7-11
36-1
5-1
CVS-7
CVS-6
P92-03-1
530
P92-02-WD
429
749
753
S18
444
S14-9
748
978
455
450
452
P92-04-WD
P92-01C-WD
P92-03-WD
86-26-6
85-26-1
34-2 UPPER TIEFORK
86-35-2-3
85-35-1
84-1 UPPER TIEFORK
LOWER TIEFORK SPRING
SP2-14
SP2-9
SP1-19
MW-5
SP1-22
MW-4
SP-47A
MW-2
SP-36
SP-58
SP-30
LOF-1
MW-1
UPF-1
BCF
Little Bear
SMH-3
SDH-3
SMH-1
SDH-2
SMH-4
SMH-2
MW-117
MH-1
SDH-1
3rd West Bleeder
DH-2
SBC-9
DH-4
SBC-10
MW-116
UT-1
4-8W
4-3W
CS-1
Trail Canyon Mine
SBC-8
3rd West South
SBC-13
DH-1A
DH-4
BC-1
BC-3
RCW4
BIRCH SPRING
BEAR SPRING
SBC-6
RCF-1
RCF2
RCF3
P-7
P-6
P-2
P-3
P-1
P-4
P-5
RCLF1
DCP-2
DCP-1
80-48
80-68
89-65
89-66
ELK SPRING
89-61
SHEBA SPRINGS
89-60
79-15
79-34
TED'S TUB
79-10
79-35
79-38
79-29
79-12
79-24
DCR01
DCR03
DCR02
79-23
09317997
HCC01
MHC01
HCC02
DEER CREEK WR WELL
HCC03
09318000
SP-4
SP-13
SP-5
ST-2A
ST-2
ST-1 (M-15)
ST-3A
SP-12
ST-3B
ST-3
ST-4
ST-5
M-14
GS-1
SP-11
UG9112
M-5
M-6
M-8
S18-2
238
229
SP-2
494
492
500
232
IO-1
Mohrland Portal
Emery Co.
Carbon Co.

Price River and North Horn Frm
Castlegate Formation
Blackhawk Formation
Area Below Coal Resource
CIA Area
Lease Boundary
Contours 200ft Interval
Main Road

Graded Dirt Road
Dirt Road
Springs
Wells
Surface Water Monit. Site

Map 5
Cumulative Hydrologic Impact Assessment
Gentry Mountain Mine

GENRTY MOUNTAIN GEOLOGY

File: map5.gra

Compiled by: Dan Smith Date: June 04, 2001

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

N

Scale 1:90000 (verify scale)

Location Map

T14S R8E

T14S R7E

T15S R7E

T15S R8E

T16S R8E

T16S R7E

T1

Price River Basin

Star Point Mine

Hiawatha Complex

Huntington Canyon #4 Mine

Bear Canyon Mine

Trail Canyon Mine

Deer Creek Mine

Gordon Creek

First Water Canyon

Corner Canyon

Nuck Woodward

North Fork

South Fork

Stanley Canyon

Los Angeles Cyn

Mud Water Cyn

Service Berry Creek

Little Park Cyn

Pole Cyn

McElphrang Cyn

Vicks Cyn

Grange Hole

Biddlecomb Cyn

Wildcattle Hollow

Gentry Ridge

Gentry Hollow

Hoog Ridge

Right Fork

Middle Fork

Miller Creek

Tie Fork Cyn

Upper Tie Fork

Little Bear Creek

Trail Canyon

McCadden Hollow

Mill Fork

Wild Horse Ridge

Left Fork Cedar Creek

Fish Creek

Huntington Creek

Sand Wash

Price River Basin

CIA Area	
Intermittent Stream	
Perennial Stream	
Contours 200ft Interval	
Main Road	
Graded Dirt Road	
Dirt Road	
Springs	
Surface Water Monit. Site	
UPDES Monit. Site	

Hydrologic Unit

1 Sand Wash
2 Miller Creek
3 Serviceberry Creek
4 Mud Water Canyon
5 Corner Canyon
6 Nuck Woodward Creek North
7 Nuck Woodward Creek South
8 Huntington Creek Sub-basin
9 Wild Cattle Hollow
10 Gentry Hollow
11 Tie Fork Canyon
12 Huntington Creek Sub-basin
13 Trail Canyon
14 Birch Springs
15 Bear Canyon
16 Fish Creek
17 Huntington Creek Sub-basin
18 Cedar Creek

Map 6
Cumulative Hydrologic Impact Assessment
Gentry Mountain Mine

SURFACE HYDROLOGY

File: map6.gra

Compiled by: Dan Smith Date: June 04, 2001

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

N

Scale 1:90000 (verify scale)

Location Map

APPENDIX C

UTAH DOGM FIELD REPORT and SUMMARY MEMO from CHARLES REYNOLDS REGARDING OCTOBER 15, 1998 INVESTIGATION of BIRCH SPRINGS and RELATED FAULTS and FRACTURES

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

Michael O. Leavitt
Governor
Lowell P. Braxton
Division Director

DQ 74

DIVISION OF OIL GAS & MINING
FIELD VISIT FORM
TECHNICAL

Date : 15 October, 1998

Time: 9:00 a.m. to 3:00 p.m.

Mines: CO-OP Bear Canyon Mine.

File Number: ACT/015/025

DOGM Staff: Jim SMITH

Other Attendees: Charles REYNOLDS, CO-OP

Purposes:

1. To examine the 3-dimensional orientation, continuity, and interconnectivity of joints (fractures) associated with Birch Spring.

2. To examine the relationship of the Blind Canyon fault to Birch Spring and associated joints.

3. To examine possible relationships between Birch Spring and the geology and geography of the terrain immediately surrounding the spring.

Observations:

1. Birch Spring is not a single source but several sources flowing from fractures and a fault, mainly on the west side of the box canyon containing the springs.

2. The Blind Canyon fault is evident on aerial photos and on the ground: the fault in the box canyon is not the Blind Canyon fault.

3. Joints and faults appear to strike consistently N-S $\pm$ 5°, but there are a few joints that strike approximately N 20°W.

4. Joints and faults appear to be basically vertical and planar, but on large vertical exposures the joints are often seen to be gently curved or even sinuous.

5. Observed faults are characterized by zones, several feet wide, of large, blocky rubble or breccia. Fracturing in the zone is dominantly vertical to near vertical, for example the fault at the west side at the head of the box canyon containing Birch Spring.

CO-OP MINING COMPANY

P.O. Box 1245
Huntington, Utah 84528

Office (435) 687-2450
FAX (435) 687-2084

December 22, 1998

Coal Program
Utah Division of Oil, Gas & Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

ACT/015/025 #2
Pam, Ken, Sharon

To Whom It May Concern,

Re: Birch Spring Action Plan, Tech Directive 005, Bear Canyon Mine, ACT/015/025, Emery County, Utah

This letter is to summarize the progress of the work which has been accomplished on Steps 3 and 4 of the Action Plan which was approved by the Division per letter dated August 7, 1998.

Step 3 consisted of conducting additional on-the-ground investigations of faults, fractures, and joints in the area of Birch Spring. On October 15, 1998, afield survey was conducted involving myself and Jim Smith, Division representative.

The survey included identifying the faults and fractures associated with and adjacent to Birch Spring. The survey began at Birch Spring. Birch Spring No. 1 and 2 sources flow from the South joint of a double fracture. A significant fracture was also identified 20 feet West of the Birch Spring fracture. A fault was observed East of Birch Spring having at least three points of offset totaling approximately 15 feet. These three geologic structures were then tracked simultaneously to the North.

During the survey, additional faults and fractures were identified East of these three structures. Two additional fractures and one additional small fault was observed East of Birch Spring and West of the Blind Canyon Fault. The total distance across this area was approximately 600 feet, with each structure being separated by what appeared to be competent blocks of formation with no significant fracturing, some as wide as 50'.

The two fractures and the fault surrounding Birch Spring were mapped Northward to the Ridge between the Birch Spring drainage and Blind Canyon (approximately 1,000 ft). The lack of outcrop prevented following the fractures beyond this point.

In mapping these fractures northward, the mapping simultaneously progressed up through the tongues of the Starpoint Sandstone. The following observations were made:

1. The joints and faults were consistently aligned North-South ± 5°. One joint of the double fracture was observed in the Spring Canyon tongue striking N 20° W. The fractures appeared to be present in all three tongues of the Starpoint Sandstone, indicating good continuity vertically, but with few exceptions were not prominently observable within the shale layers as they were within the sandstone formations.

2. The spacing between the faults and fractures showed limited variation, but appeared to be steadily converging Northward and/or upward. Due to the terrain in the area, no determination could be made on what component of the convergence might be horizontal or vertical. The fractures did not completely converge within the mapped area, and none of the fractures converged with the Blind Canyon fault, but seemed to parallel the fault.

3. All of the joints and faults were nearly vertical and planar, and interconnectivity was not well developed or apparent.

The attached map delineates the fractures which were mapped in relation to the Blind Canyon fault and the Spring. From the mapping, it appeared that the joints and fractures have good continuity and may conduct water horizontally in a North/South direction and vertically. Vertical conductivity, however, could potentially be limited by the shale layers, which appear to heal the fractures within the shale formations. None of the fractures converge with the Blind Canyon fault in the vicinity of Birch Spring, and no apparent flow paths were observed to facilitate East/West movement of water from the Blind Canyon Fault to Birch Spring. The fracture system could allow local recharge from precipitation and snowmelt into Birch Spring, which may be enhanced by surficial fractures and/or restricted by shale layers.

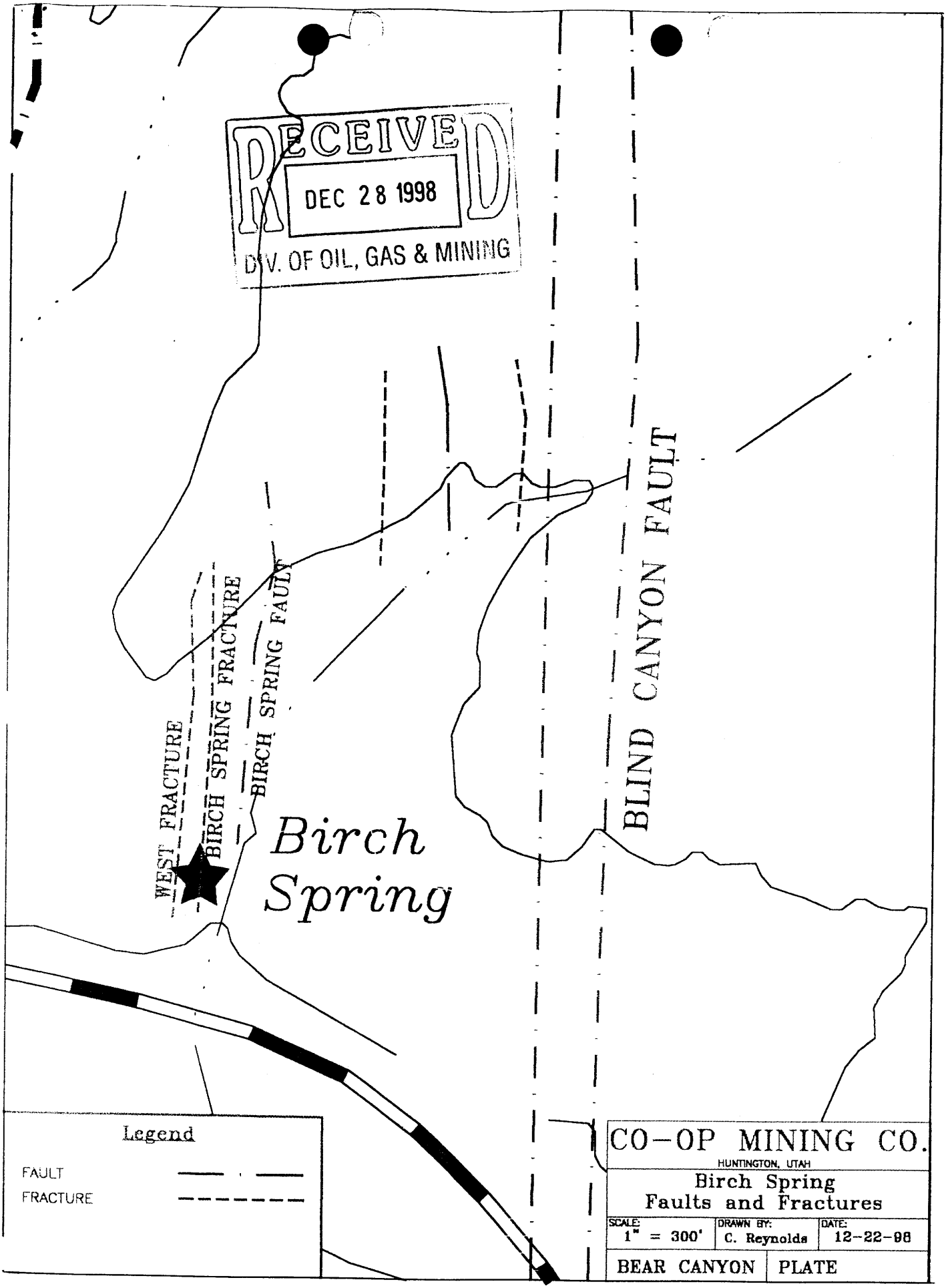
Item 4 of the Action Plan involved conducting a complete isotopic and chemical investigation of the Bear Canyon Mine permit and surrounding areas. This is to inform the Division that all data has been collected by Mayo and Associates. The information will be compiled into a revised "Probable Hydrologic Consequences" document which will be submitted to the Division upon completion for inclusion in the Bear Canyon Mine PAP.

If you have any questions, please call me at (435) 687-2450.

Thank You,

Charles Reynolds, PE
Mining Engineer/Environmental Coordinator

Attachment(s)


RECEIVED
DEC 28 1998
DIV. OF OIL, GAS & MINING
BLIND CANYON FAULT
BIRCH SPRING FAULT
BIRCH SPRING FRACTURE
WEST FRACTURE
Birch Spring
Legend
FAULT
FRACTURE
CO-OP MINING CO.
HUNTINGTON, UTAH
Birch Spring
Faults and Fractures
SCALE: 1" = 300'
DRAWN BY: C. Reynolds
DATE: 12-22-98
BEAR CANYON
PLATE

EMERY COUNTY

Planning Commission

Mack Huntington, Chairman
P.O. Box 417
Castle Dale, Utah 84513

C/015/025
Incoming
Copy Baker

October 12, 2000

Mr. Wendell Owen
C. W. Mining Company
P.O. Box 1245
Huntington, Utah 84528

Dear Mr. Owen:

This letter is provided to update you regarding the status of your application for a level 3 conditional use permit for the Bear Canyon No. 3 Mine. As you are aware, a public hearing regarding this matter was held on September 5, 2000. In keeping with the Memorandum of Understanding between Emery County and the Utah Department of Natural Resources, the conditional use permit will be issued when you receive approval of your mine plan application from the Division of Oil, Gas & Mining.

If you have any questions, please contact the Emery County Zoning Office at (435) 381-5374.

Sincerely,

Mack Huntington

Mack Huntington, Chairman
Emery County Planning Commission

Post-it® Fax Note 7671	Date 6/4/01	# of pages ▶ 1
To Paul Baker	From Maree Knight	
Co./Dept. DOGM	Co. Emery Co Zoning	
Phone #	Phone # (435) 381-5374	
Fax # (801) 359-3940	Fax #	

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

In Reply Refer To
(CO/KS/NE/UT)

September 19, 2000

Mr. Darron Haddock, Permit Supervisor
Utah Division Oil, Gas, and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

RE: Section 7 Consultation on the Wild Horse Ridge Mine application, Co-Op Mining Company, Bear Canyon Mine, ACT/015/025-SR98(1)

Dear Mr. Haddock:

The U.S. Fish and Wildlife Service (Service) has reviewed your letter of September 11, 2000. We concur with your "not likely to adversely affect" determination for threatened and endangered species.

Potential impacts to proposed or listed species from mining activities have been previously addressed in the Service's September 24, 1996 Biological Opinion and Conference Report on Surface Coal Mining and Reclamation Operations under the Surface Coal Mining and Reclamation Act of 1977. As part of the terms and conditions of this BO, the regulatory authority must implement and require compliance with any species-specific protective measures developed by the Service field office and the regulatory authority. No species-specific protective measures are considered necessary for the subject project.

Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered. Only a Federal agency can enter into formal Endangered Species Act section 7 consultation with the Service. A Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment by giving written notice to the Service of such a designation. The ultimate responsibility for compliance with ESA section 7, however, remains with the Federal agency.

As you are aware, the peregrine falcon was removed from the federal list of endangered and threatened species per Final Rule of August 25, 1999 (64 FR 46542). Protection is still provided for this species under authority of the Migratory Bird Treaty Act (16 U.S.C. 703-712) which makes it unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. When taking of migratory birds is determined by the applicant to be the only alternative, application for

State of Utah
Department of Community and Economic Development
Division of State History
Utah State Historical Society

Michael O. Leavitt
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500 FAX: 533-3503 TDD: 533-3502
ushs@history.state.ut.us http://history.utah.org

cc: Paul Daron

December 20, 1999

Daron R. Haddock
Permit Supervisor
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City UT 84114-5801

RE: Wild Horse Ridge Permit Revision, Co-Op Mining Company, Bear Canyon Mine, ACT/015/025-SR99(1), Folder #2, Emery County, Utah

In Reply Please Refer to Case No. 95-0996

Dear Mr. Haddock:

The Utah State Historic Preservation Office received the above referenced information on December 7, 1999. After consideration of the treatment plan for Bear Creek Rock Shelter, 42EM 1572, the Utah Preservation Office concurs with the determination of No Historic Properties Affected based on avoidance of the archaeological site.

This information is provided on request to assist with Section 106 responsibilities as specified in §36CFR800. If you have questions, please contact me at (801) 533-3555. My email address is: jdykman@history.state.ut.us

As ever,

James L. Dykmann
Compliance Archaeologist

JLD:95-0996 OSM/NPA

State of Utah

Department of Community and Economic Development
Division of State History
Utah State Historical Society

Michael O. Leavitt
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500 FAX: 533-3503 TDD: 533-3502
ushs@history.state.ut.us http://history.utah.org

February 14, 2001

Paul Baker
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City UT 84114-5801

Copy [redacted] Paul
Incoming
C/015/025

RE: Wild Horse Ridge Permit Revision, Co-Op Mining Company, Bear Canyon Mine, ACT/015/025-SR99(1), Folder #2, Emery County, Utah

In Reply Please Refer to Case No. 95-0996

Dear Mr. Baker:

The Utah State Historic Preservation Office received the above referenced information. The report states that no cultural resources were located in the project area. We, therefore, concur with the report's recommendation of No Historic Properties Affected.

This information is provided on request to assist with Section 106 responsibilities pursuant to §36CFR800. If you have questions, please contact me at (801) 533-3555. My email address is: jdykman@history.state.ut.us

As ever,

James L. Dykmann
Compliance Archaeologist

JLD:95-0996 DOGM

United States Department of Agriculture **Forest Service** **Manti-La Sal National Forest**

Supervisor's Office
599 West Price River Drive
Price, UT 84501
Phone # (435) 637-2817
Fax# (435) 637-4940

File Code: 2820-4
Date: May 21, 2001

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
Attn: Paul Baker
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, UT 84114-5801

Re: Addition of Wild Horse Ridge Leases to Bear Canyon Mine, Co-op Mining Company, Bear Canyon Mine, ACT/015/025-SR98-1, Folder #2, Emery County, Utah

Dear Paul:

The Manti-La Sal National Forest has completed our review of the latest information submitted for the Wild Horse Ridge Amendment to the Bear Canyon Mine MRP. All of our comments submitted on March 15, 2001, have been adequately addressed. We now consent to the amendment. This consent does not include any mining which would cause escarpment failure.

We request that spring 16-7-24-3, which is located just outside the Forest boundary, be added to the list for monitoring. Page 129 of the "Probable Hydrologic Consequences" by Mayo and Associates contains a statement that this spring may be disrupted by mining.

Please contact Dale Harber at (435) 636-3548 if you have any questions.

Sincerely,

Ann King

for ELAINE J. ZIEROTH
Forest Supervisor

BUREAU OF LAND MANAGEMENT COMMENTS

cc: Daron
Pam

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
U-024316
U-024318
U-020668
U-038727
(UT-070)

RECEIVED
MAY 04 2000
DIVISION OF
OIL, GAS AND MINING

MAY 01 2000

Daron R. Haddock
Permit Supervisor
Division of Oil, Gas and Mining
P.O. Box 145801
Salt Lake City, Utah 84114-5801

Re: Addition of Wild ~~Horse Ridge~~ Leases to Bear Canyon Mine, Co-Op Mining Company, Bear Canyon Mine, ACT/015/025-SR98-1

Incoming

Dear Mr. Haddock:

On December 6, 1999, the Bureau of Land Management (BLM) received from your office a copy of the subject significant revision to the Bear Canyon Mine Reclamation Plan (MRP) for our review.

Surface lands overlaying the Federal coal leases are administered by the United States Forest Service (USFS). One exception can be found in Section 31 of T.16S. R.8E. as described below.

Our comments on the significant revision follow:

1. It appears that both the Blind Canyon and Tank Seams will be accessed from portals located on Co-Op fee property. From Plate 2-2, the only surface lands administered by the BLM found within the new proposed permit boundary are found in T.16S. R.8E. S.31, NW1/4NE1/4, NE1/4NW1/4 SLBM which contains 80 acres, more or less.

2. The mine plans located on Plates 3-4A (Blind Canyon Seam) and 3-4C (Tank Seam) indicate that all surface lands administered by the BLM are well outside any influences from mining, including subsidence, and, therefore, mining will not result in any surface impacts on BLM-administered surface lands.

3. The BLM is the administrating agency for the underground Federal coal leases found within the revised permit area. An amended R2P2 to include the additional Wild Horse Ridge Federal leases has not been submitted to the BLM for review for determination of maximum economic recovery.

Thus, the BLM can recommend continuation of the review process, but cannot support final approval of the significant revision until an R2P2 has been reviewed and determined to be in compliance with the Mineral Leasing Act of 1920, as amended, and the regulations found at 43 CFR 3480. The R2P2 must also be in compliance with the Federal lease terms and conditions, and must achieve maximum economic recovery of the Federal coal.

WATER USERS' OBJECTION AND REQUEST FOR CONFERENCE

Wild Horse Ridge

Gary A. Weston
Earl Jay Peck
Neil R. Sabin
Harold C. Verhaaren
Mark H. Anderson
Richard M. Hymas
John K. Mangum
Richard K. Hincks
Noel S. Hyde
J. Craig Smith
Jay R. Mohlman
David B. Hartvigsen
Marilynn K. Burningham
Philip S. Lott
Annette F. Sorensen
Scott M. Ellsworth
Daniel J. McDonald
D. Scott Crook

NIELSEN & SENIOR
Attorneys & Counselors
Since 1882

Suite 1100, Eagle Gate Plaza & Office Tower
60 East South Temple, Salt Lake City, Utah 84111
Post Office Box 11808, Salt Lake City, Utah 84147
Telephone (801) 532-1900 Fax (801) 532-1913
nielsen.senior@ns-law.com

A Professional Corporation

Ogden Office
2909 Washington Blvd., Suite 100
Ogden, Utah 84401
Telephone (801) 394-1900
Fax (801) 622-2200

January 27, 2000

ACT/015/025 Incoming

Mr. Lowell Braxton, Director
DIVISION OF OIL, GAS, & MINING
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Re: Cause No. ACT/015/025

Dear Mr. Braxton:

Pursuant to Utah Administrative Code R645-300-122, the Huntington-Cleveland Irrigation Company submits the following objections to the addition of the Wild Horse Ridge Leases to the Bear Canyon Mine, ACT/015/025-SR98-1, and requests that the Division hold an informal conference at its Salt Lake City offices on the application pursuant to R645-300-123.

Among other things, Huntington-Cleveland notes with concern that the *Potential Groundwater Quantity and Quality Impact* statements (***Gentry Mountain CHIA***, September 16, 1998, pp. 26–27) contain little more than basic generalizations about groundwater which any decently informed person could draft without reference to anything, rather than the specific observations and conclusions so necessary to a proper conclusion and recommendation. The impact of such a considerable expansion as Co-Op Mining Company contemplates surely requires an appropriately serious evaluation. The short-shrift these critical matters receive in the present CHIA will not do.

Huntington-Cleveland also notes that the most recent measurements of water in and around the Bear Canyon mine apparently took place some time in late 1996 or 1997. Inasmuch as water levels and flows can change quite rapidly, information as much as three years out of date seems rather antiquated. More current water measurements ought to be obtained before the Division reaches a final decision regarding the Co-Op Mining Company's application.

We look forward to the opportunity to discuss these and other concerns.

Sincerely,

J. Craig Smith
Scott M. Ellsworth

JCS/ch
cc: Huntington Cleveland Irrigation Company

DETERMINATION OF COMPLETENESS

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

November 3, 1999

Wendell Owen
CO-OP Mining
P.O. Box 1245
Huntington, Utah 84528

Re: Determination of Administrative Completeness, Wild Horse Ridge Mine Application, Co-Op Mining, Bear Canyon Mine, ACT/015/025-SR98-1, Folder #3, Emery County, Utah

Dear Mr. Owen:

The Division has completed a review of the additional information you submitted dated September 27, 1999, which amended the Wild Horse Ridge Application Package. The purpose of this review was to determine the Administrative Completeness of your application or in other words determine if the application contains all information necessary to initiate processing and public review. With the additional information which you supplied, your application is now considered to be administratively complete. A copy of the review worksheet is enclosed for your records. You will note that even though your application is considered administratively complete, there may be a number of technical deficiencies that will still require additional responses or corrections.

A technical review of your plan has been initiated. Technical deficiencies will be forwarded to you when the review is completed. The Division will also coordinate with other agencies and incorporate their comments into our review process. Three additional copies of your application will need to be submitted as quickly as possible for this process. Issues raised will need to be resolved prior to permit issuance.

At this time you should publish a Notice of Complete Application for the Wild Horse Ridge Revision to the Bear Canyon Mine as required by R645-300-121. A copy of the publication should be sent to the Division as soon as it is available. You should also insure that a copy of the application is on file at the Emery County Courthouse. The Division will complete a technical analysis which must find that your application is technically complete. We anticipate that additional information may be necessary to make your application technically complete and

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor

Kathleen Clarke
Executive Director

Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

December 1, 1999

Ranvir Singh
Office of Surface Mining
1999 Broadway, Suite 3320
Denver, Colorado 80202

Richard Manus
Bureau of Land Management
125 South 6 West
Price, Utah 84501

Janette S. Kaiser, Forest Supervisor
U.S. Forest Service
Manti-La Sal National Forest
599 West Price River Road
Price, Utah 84501

Re: Addition of Wild Horse Ridge Leases to Bear Canyon Mine, Co-Op Mining Company, Bear Canyon Mine, ACT/015/025-SR98-1, Folder #2, Carbon County, Utah

Dear Ms. Kaiser and Messrs. Manus & Singh:

The Division has received a proposal by Co-Op Mining Company to add two Federal Leases and an additional fee lease (Wild Horse Ridge Addition) to their permit for the Bear Canyon Mine. We have determined the application to be administratively complete and are forwarding copies of the revised plans to you for your review. We anticipate completing our review of this significant revision by January 3, 2000. Could you please provide your comments/concurrence on this permitting action by that date.

If you have any questions on this plan change, please call me (801) 538-5325 or Sharon Falvey at (801) 538-5260.

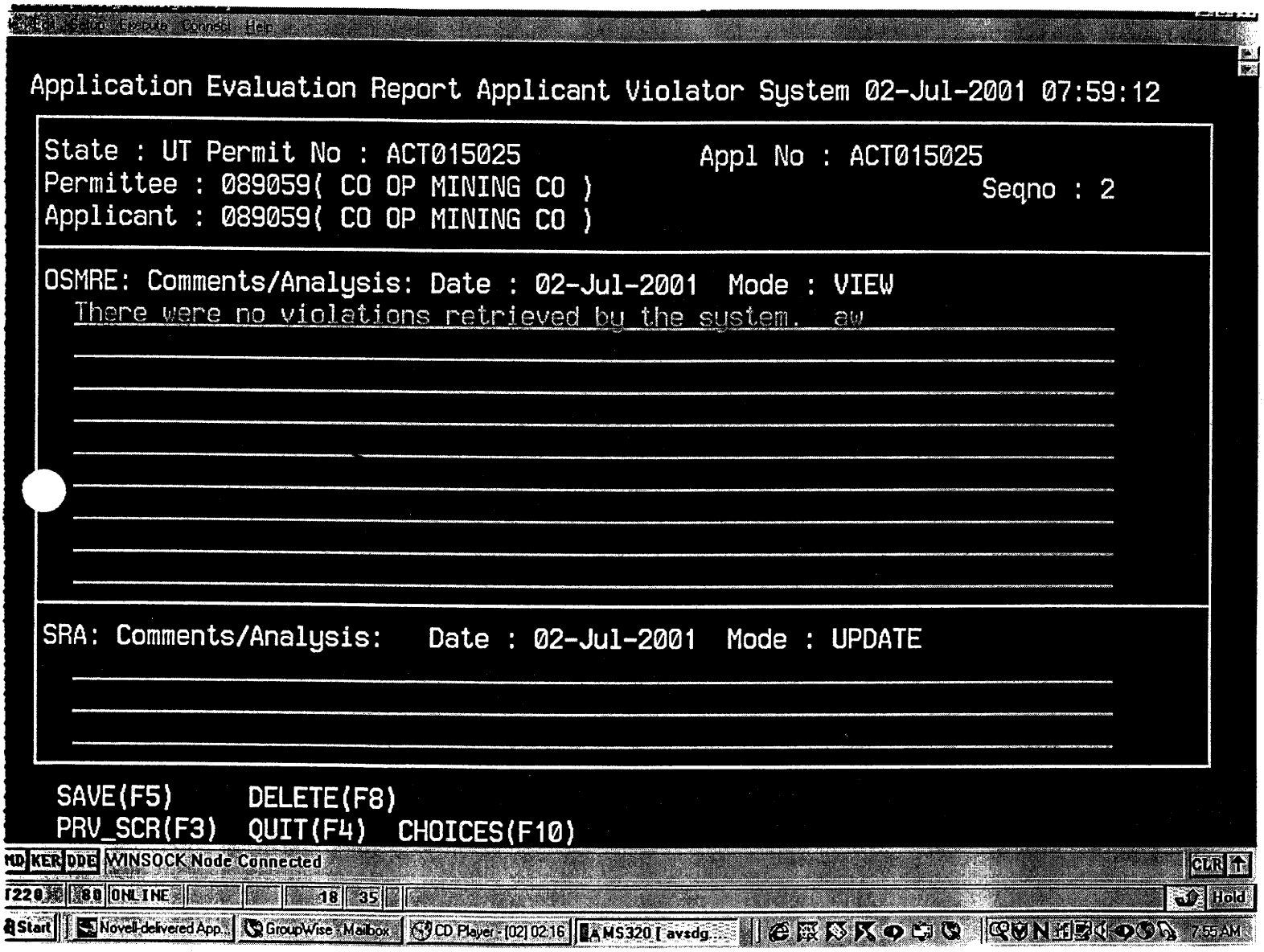
Sincerely,

Daron R. Haddock

Daron R. Haddock
Permit Supervisor

Enclosure
cc: Mark Page, Water Rights, w/o
Dave Ariotti, DEQ, w/o
Bill Bates, DWR, w/o
David Terry, SITLA, w/o
Price Field Office
O:\015025.BCN\FINAL\WHTRSMLTR.wpd

APPLICANT VIOLATOR SYSTEM CHECK


Application Evaluation Report Applicant Violator System 02-Jul-2001 07:59:12
State : UT Permit No : ACT015025
Appl No : ACT015025
Permittee : 089059(CO OP MINING CO)
Seqno : 2
Applicant : 089059(CO OP MINING CO)
OSMRE: Comments/Analysis: Date : 02-Jul-2001 Mode : VIEW
There were no violations retrieved by the system. aw
SRA: Comments/Analysis: Date : 02-Jul-2001 Mode : UPDATE
SAVE(F5) DELETE(F8)
PRV_SCR(F3) QUIT(F4) CHOICES(F10)
WINSOCK Node Connected
ONLINE
Start
Novell-delivered App...
GroupWise Mailbox
CD Player - [02] 02:16
MS320 [avsdg
7:55 AM

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

July 2, 2001

TO: Compliance File

FROM: Pamela Grubaugh-Littig, Permit Supervisor

RE: 510 (c) Recommendation for Significant Revision, Wild Horse Ridge Addition, Co-Op Mining Company, Bear Canyon Mine, C/015/025-SR01A

As of this writing of this memo, there are no NOVs or COs which are not corrected or in the process of being corrected for the Bear Canyon Mine. There are no finalized civil penalties, which are outstanding and overdue in the name of Co-Op Mining Company. Co-Op Mining Company does not have a demonstrated pattern of willful violations, nor have they been subject to any bond forfeitures for any operation in the state of Utah.

Attached is an OSM Applicant Violator System report that states there were no violations retrieved.

vs
O:\015025.BCN\Compliance\AVS 061301.doc

143 SOUTH MAIN ST.
P.O.BOX 45838
SALT LAKE CITY, UTAH 84145
FED.TAX I.D.# 87-0217663

Newspaper Agency Corporation

Salt Lake Tribune (NA) DESERET NEWS

CUSTOMER'S COPY

PROOF OF PUBLICATION

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	DATE
CO-OP MINING COMPANY P. O. BOX 1245 HUNTINGTON UT 84528	CA872450L-07	12/28/99

ACCOUNT NAME	
CO-OP MINING COMPANY	
TELEPHONE	INVOICE NUMBER
435-687-2450	TL8200GNAQ1
SCHEDULE	
START 12/07/99 END 12/28/99	
CUST. REF. NO.	
CAPTION	
NOTICE Co-Op Mining Company,	
SIZE	
58 LINES 1.00 COLUMN	
TIMES	RATE
4	1.16
MISC. CHARGES	AD CHARGES
.00	269.12
	TOTAL COST
	269.12

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah 84528 hereby announces its intent to expand its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine. Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit expansion area, which will include new portals in the Wild Horse Ridge area, consists of 620.26 private acres and 1,338.17 federal acres within Federal Coal Leases U-020668 and U-38727. The area can be found on the USGS Hiawatha Quadrangle map and is described as follows:

T 16S, R7E, SLBM
Section 24 All portions east of north/south fault except NE1/4NE1/4
Section 25 All portions east of the north/south fault
T 16S, R8E, SLBM
Section 19 S1/2NW1/4, SW1/4, SW1/4SE1/4
Section 30 W1/2, W1/2NE1/4, NW1/4SE1/4
Section 31 NE1/4NW1/4, NW1/4NE1/4

The area is shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84114-5801. Copies of the Wild Horse Ridge application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah 84513. 8200GNAQ

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT T
ADVERTISEMENT OF NOTICE Co-Op Mining Company,
CO-OP MINING COMPANY WAS PUBLISHED BY THE NEWSP
CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAIL
PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCULATION IN UTAH, A
IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON START 12/07/99 END 12/28/99

SIGNATURE

DATE 12/28/99

NOTARY PUBLIC
JENNIFER MOONEY
4925 Harsham St.
Salt Lake City, UT 84105
My Commission Expires
March 31, 2003
STATE OF UTAH

THIS IS NOT A STATEMENT BUT A "PROOF OF PUBLICATION"
PLEASE PAY FROM BILLING STATEMENT.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 7th day of December, 1999 and that the last publication of such notice was in the issue of such newspaper dated the 28th day of December, 1999.

Kevin Ashby

Kevin Ashby - Publisher

Subscribed and sworn to before me this 28th day of December, 1999.

Linda Thayn

Notary Public My commission expries January 10, 2003 Residing at Price, Utah

Publication fee, $ 158.40

LINDA THAYN
NOTARY PUBLIC - STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXP. 1-10-2003

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to expand its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is Located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit expansion area, which will include new portals in the Wild Horse Ridge area, consists of 620.26 private acres and 1,338.17 federal acres within Federal Coal Leases U-020668 and U-38727. The area can be found on the USGS Hiawatha Quadrangle map and is described as follows:

T16S, R7E, SLBM	
Section 24	All portions east of north/south fault except NE1/4NE1/4
Section 25	All portions east of the north/south fault
T16S, R8E, SLBM	
Section 19	S1/2NW1/4, SW1/4, SW1/4SE1/4
Section 30	W1/2, W1/2NE1/4, NW1/4SE1/4
Section 31	NE1/4NW1/4, NW1/4NE1/4

The area is shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah, 84114-5801. Copies of the Wild Horse Ridge application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah, 84513.

Published in the Emery County Progress December 7, 14, 21 and 28, 1999.

EXHIBIT "A"

PERMIT AREA

LEGAL DESCRIPTION

Permit Number C/015/025

EXHIBIT "A"

PERMIT AREA

In accordance with the **RECLAMATION AGREEMENT**, the **PERMITTEE** intends to conduct coal mining and reclamation activities on or within the **PERMIT AREA** as described hereunder: (The bonded area equals the permit area.)

Total acres of **PERMIT AREA:** 3336.18

Legal Description of **PERMIT AREA:**

A. T16S,R7E SLBM	Sec.	14 SW 1/4, SE 1/4
	Sec.	23 E1/2. E1/2 W1/2
	Sec.	24 W1/2, W1/2 E1/2
	Sec.	25 NW1/4NW1/4,E1/2NW1/4SW1/4, E1/2SW1/4
	Sec.	26NE1/4 NE1/4, NW1/4NE1/4, N1/2SW1/4NE1/4 and the access/haul road and topsoil storage areas as shown on Plage 2-1.
B. T16S,R7E SLBM	Sec.	13 W1/4
	Sec.	14 NE 1/4
	Sec.	24 E1/2 SE1/4, SE1/4 NE1/4
T16S, R8E SLBM	Sec.	19 S1/2 NW1/4, SW1/4, SW1/4 SE1/4
C. T16S, R7E SLBM	Sec.	25 SW1/4NW1/4, NW1/4 SW1/4
D. T16S, R7E SLBM	Sec.	25 E1/2
T16S, R8E SLBM	Sec.	30 W1/2, W1/2 NE1/4, NW1/4 SE1/4
	Sec.	31 NE1/4 NW1/4, NW1/4 NE1/4

This is the **PERMIT AREA** that is covered by the reclamation surety provided in Exhibit "B".
IN WITNESS WHEREOF the **SURETY** has hereunto set it's signature and seal this 28th day of June, 20 01.

LYNDON PROPERTY INSURANCE COMPANY
SURETY

By: Deborah A. Murphy

Title: Attorney-in-Fact

Exhibit "B" - **BONDING AGREEMENT**
SURETY BOND

Permit Number: C/015/025
Surety Number: L-0601-C-015-025

SURETY BOND
(FEDERAL COAL)
--ooOOoo--

THIS SURETY BOND entered into and by and between the undersigned **PERMITTEE**, and **SURETY COMPANY**, hereby jointly and severally bind ourselves, our heirs, administrators, executors, successors, and assigns unto the State of Utah, Division of Oil, Gas & Mining (**DIVISION**), and the U.S. Department of Interior, Office of Surface Mining Reclamation and Enforcement (**OSM**) in the penal sum of $1,825,000.00 (Surety Bond Amount) for the timely performance of reclamation responsibilities of the surface disturbance described in Exhibit "A" of this **RECLAMATION AGREEMENT.**

This **SURETY BOND** shall remain in the effect until all of the **PERMITTEE's** reclamation obligation have been met and released by the **DIVISION** and is conditioned upon faithful performance of all of the requirement of the Act, the applicable rules and regulations, SMCRA, the approved permit and the **DIVISION**.

The **SURETY** will not cancel this bond at any times for any reason, including non-payment of premium or bankruptcy of the Principal during the period of liability.

The **SURETY** and their successors and assigns, agree to guarantee the obligation and to indemnify, defend, and hold harmless the **DIVISION** and **OSM** from any and all expenses which the **DIVISION** and **OSM** may sustain as a result of the **PERMITTEE's** failure to comply with the condition(s) of the reclamation obligation.

The **SURETY** will give prompt notice to the **PERMITTEE** and to the **DIVISION** and **OSM** of any notice received or action alleging to insolvency or bankruptcy of the **SURETY,** or alleging any violations or regulatory requirement which could result in suspension or revocation of the **SURETY's** license.

Terms for release or adjustment of this **BOND** are as written and agreed to by the **DIVISION** and the **PERMITTEE** in the **RECLAMATION AGREEMENT** incorporated by reference herein, to which this **SURETY AGREEMENT** has been attached as Exhibit "B".

Exhibit "B" - **BONDING AGREEMENT**
SURETY BOND

Permit Number: C/015/025

IN WITNESS WHEREOF, the **PERMITTEE** has hereunto set it's signature and seal this 28th day of June, 20 01 .

CW MINING COMPANY
PERMITTEE

By: [signature]
Title: President

IN WITNESS WHEREOF, the **SURETY** has hereto set it's signature and seal this 28th day of June, 2001.

LYNDON PROPERTY INSURANCE COMPANY
SURETY

By: Deborah A. Murphy
Title: Attorney-in-Fact

ACCEPTED BY THE STATE OF UTAH:

[signature]
Lowell P. Braxton, Director
Division of Oil, Gas & Mining

NOTE: An **Affidavit of Qualification** must be completed and attached to this form for each authorized agent or officer. Where one signs by virtue of Power of Attorney for a company, such Power of Attorney must be filed with this Agreement. If the **PERMITTEE** is a corporation, the Agreement shall be executed by it's duly authorized officer.

AFFIDAVIT OF QUALIFICATION
SURETY COMPANY
--ooOOoo--

I, Deborah A. Murphy, being first duly sworn under oath, deposes and says that he/she is the (officer or agent) Attorney-in-Fact of Lyndon Property Insurance Company; and that he/she is duly authorized to execute and deliver the foregoing obligations; and that said SURETY COMPANY is authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations herein.

(Signed) Deborah A Murphy Attorney-in-Fact
Surety Company Officer - Position

Subscribed and sworn to before me this 28th day of June, 2001.

Notary Public

My Commission Expires:

Nov. 21, 2002.

Attest:

STATE OF KENTUCKY)
) ss:
COUNTY OF FAYETTE)

LYNDON PROPERTY INSURANCE COMPANY
520 MARYVILLE CENTRE DRIVE, SUITE 500
ST. LOUIS, MISSOURI 63141-5814

POWER OF ATTORNEY

16-004

KNOWN ALL MEN BY THESE PRESENTS, that LYNDON PROPERTY INSURANCE COMPANY, a Missouri Corporation, having its principal office in St. Louis, Missouri pursuant to the following resolution, adopted by the Board of Directors of the Corporation on the 27 th day of January, 1983.

RESOLVED, Pursuant to Section 3.1 and 4.12 of the By-laws, the following Rules shall govern the execution of the Corporation of bonds, undertakings, recognizances, contracts and other writings in the nature thereof:

(1) That the President or any Vice President or Assistant Vice President, the Secretary or Assistant Secretary, the Treasurer or Assistant Treasurer or any Attorney-in-Fact may execute for and in behalf of the Corporation any and all bonds, undertakings, recognizances, contracts and other writings in the nature thereof, the same to be attested when necessary by the Secretary or Assistance Secretary, and the seal of the Corporation affixed thereto; and that the President, any Vice President or the Secretary or Assistant Secretary may appoint and authorize Attorneys-in-Fact to execute or to the execution of all such writings on behalf of the Corporation and to affix the seal of the Corporation thereto. The Secretary or Assistant Secretary may not both execute and attest the same bonds, undertakings, recognizances, contracts and other writings of the Corporation.

(2) Any such writing executed in accordance with these Rules shall be as binding upon the Corporation in any case as though signed by the President and attested by the Secretary.

(3) The signature of the President, or any Vice President or Assistant Vice President, the Secretary or Assistant Secretary, or the Treasurer or Assistant Treasurer and the seal of the Corporation may be affixed by facsimile on any power of attorney granted pursuant to this Resolution, and the certificate bearing such facsimile signature and seal shall be valid and binding on the Corporation.

(4) Such Attorneys-in-Fact shall have authority to certify or verify copies of this Resolution, the By-laws of the Corporation, and any affidavit of record of the Corporation necessary to the discharge of their duties.

This Power of Attorney is signed and sealed in facsimile under and by the authority of the above Resolution.

DOES HEREBY MAKE, CONSTITUTE AND APPOINT: **Lucy L. Parks, Stephen L. Helmbrecht, William H.M. Patterson, Deborah A. Murphy, Sue H. McMillen, Ernestine Stapleton**

its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred in its name, place and stead to sign, execute, acknowledge and deliver in its behalf, and as its act and deed, without power of redelegation as follows:

Bonds guaranteeing the fidelity of persons holding places of public or private trust, guaranteeing the performance of contracts other than insurance policies; and executing or guaranteeing bonds and undertakings required or permitted in all actions or proceedings or by law allowed, provided the amount of no one ıd exceeds **Two Million Five Hundred Thousand and 00/100 Dollars ($2,500,000.00)**: and to bind LYNDON PROPERTY INSURANCE COMPANY thereby .ully and to the same extent as if such bond or undertaking was signed by the duly authorized officers of LYNDON PROPERTY INSURANCE COMPANY, and all the acts of said Attorney(s)-in-Fact pursuant to the authority herein given are hereby ratified and confirmed.

In Witness Whereof, LYNDON PROPERTY INSURANCE COMPANY of St. Louis, Missouri, has caused this Power of Attorney to be signed by its President and its Corporate seal to be affixed this 12th day of March, 1999.

LYNDON PROPERTY INSURANCE COMPANY

State of Missouri
County of St. Louis ss:

LYNDON PROPERTY INSURANCE COMPANY CORPORATE SEAL 1978 MISSOURI

BY: Roland G. Anderson
ROLAND G. ANDERSON, President

On this the 12th day of March, 1999, before the subscriber, a Notary Public of the State of Missouri in and for the County of St. Louis, duly commissioned and qualified, came ROLAND G. ANDERSON of Lyndon Property Insurance Company to me personally known to be the individual and officer described herein, and who executed the preceding instrument, and acknowledged the execution of the same, and being by me duly sworn, deposed and said, that he is the officer of the Company aforesaid, and that the seal fixed to the preceding instrument is the Corporate Seal of the Company, and the Corporate Seal and signature as an officer were duly affixed and subscribed to the said instrument by the authority and direction of the Corporation, and that the resolution of the Company, referred to in the preceding instrument.

In Testimony Whereof, I have hereunto set my hand, and fixed my official seal at St. Louis, Missouri, the day and year above written.

MARIE E. DUFF
Notary Public - State of Missouri
County of Jefferson
My Commission Expires 01/08/2002

Marie E. Duff

I, Richard C. Hackett, Assistant Secretary of the Lyndon Property Insurance Company, do hereby certify that the foregoing is a true and accurate copy of a Power of Attorney, executed by said Lyndon Property Insurance Company which is still in full force and effect.

In Witness Whereof, I have hereunder set my hand and affixed the seal of said Corporation at St. Louis, Missouri, this 28th day of June, 2001.

LYNDON PROPERTY INSURANCE COMPANY

State of Missouri
County of St. Louis ss:

LYNDON PROPERTY INSURANCE COMPANY CORPORATE SEAL 1978 MISSOURI

Richard C. Hackett
ASSISTANT SECRETARY

AFFIDAVIT OF QUALIFICATION
PERMITTEE
--ooOOoo--

I, Bill Stoddard, being first duly sworn under oath, deposes and says that he/she is the (officer or agent) President of C.W. Mining Co; and that he/she is duly authorized to execute and deliver the foregoing obligations, and that said PERMITTEE is authorized to execute the same and has complied in all respects with the laws of Utah in reference to commitments, undertakings and obligations herein.

(Signed) BW Stoddard Pres.
Name - Position

Subscribed and sworn to before me this 2nd day of July, 2001.

Leanne Stone 7-02-01
Notary Public

My Commission Expires:

July 10, 2001.

Notary Public
LEANNE STONE
P.O. Box 300
Huntington, Utah 84528
My Commission Expires
July 10, 2001
State of Utah

Attest:

STATE OF Utah)
) ss:
COUNTY OF Emery)

AFFIDAVIT OF QUALIFICATION
DIRECTOR
--ooOOoo--

Lowell Braxton, being first duly sworn under oath, deposes and says that he is the Director for the Division of Oil, Gas and Mining, Department of Natural Resources, State of Utah; and that he is duly authorized to execute and deliver the foregoing obligations; and that said Director is authorized to execute the same by authority of laws on behalf of the State of Utah.

(Signed) Lowell Braxton
Lowell Braxton, Director
Division of Oil, Gas and Mining

Subscribed and sworn to before me this 3rd day of July, 2001.

Victoria A. Bailey
Notary Public

My Commission Expires:

February 29, 2004.

Attest:

STATE OF Utah)
) ss:
COUNTY OF Salt Lake)

NOTARY PUBLIC
VICTORIA A. BAILEY
1594 W. N. Temple #1210
Salt Lake City, UT 84116
My Commission Expires
February 29, 2004
STATE OF UTAH